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EXCESS OUTFITTING MATERIALS IN
SHIP CONSTRUCTION NAVY (SCN)
SHIPBUILDING PROGRAMS:
AN ANALYSIS OF THE INITIAL ALLOWANCE
DEVELOPMENT PROCESS

by

Richard H. Feierabend

March 1987

Thesis Advisor:

Thomas P. Moore

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Excess Outfitting Materials in Ship Construction Navy (SCN)
Shipbuilding Programs: An Analysis of the Initial Allowance
Development Process

by

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ABSTRACT

This thesis investigates the accumulation of excess outfitting material during a ship's initial supply support development process. The SCN allowance development process is discussed in general. The Integrated Stock Number Sequence Listing (ISNSL), the primary supporting sub-system for Ship Construction Navy (SCN) shipbuilding program allowance development, is reviewed. Analyses of ISNSL statistics from FFG-7 and SSBN-726 Class shipbuilding programs are conducted. The affects of configuration changes and adjustments to item management information, particularly the Best Replacement Factor (BRF) on excess outfitting materials is reviewed.

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ABBREVIATIONS AND ACRONYMS

APL	Allowance Parts List
BRF	Best Replacement Factor
CF	Contractor Furnished
CFE	Contractor Furnished Equipment
CFM	Contractor Furnished Material
CNO	Chief of Naval Operations
COSAL	Coordinated Shipboard Allowance List
DLA	Defense Logistics Agency
DOD	Department of Defense
DOP	Designated Overhaul Point
FILL	Fleet Issue Load List
FLSIP	Fleet Logistics Support Improvement Program
FMSO	Fleet Material Support Operation
FOMIS	Fitting Out Management Information System
GF	Government Furnished
GFE	Government Furnished Equipment
GFM	Government Furnished Material
HSC	Hardware Systems Command
ICP	Inventory Control Point
ILS	Integrated Logistic Support
ISEA	In Service Engineering Activity
ISNSL	Integrated Stock Number Sequence List
LSA	Logistics Support Analysis

MDF	Maintenance Data File
MIL-STD	Military Standard
MLSF	Mobile Logistics Support Force
NAVSEA	Naval Sea Systems Command
NAVSUP	Naval Supply System Command
NIIN	National Item Identification Number
OSI	Operating Space Item
PECI	Preliminary Equipment Configuration Index
PESA	Provisioning Engineering Support Activity
PPS	Provisioning Performance Schedule
PRS	Provisioning Requirements Statement
PSI	Program Support Interest File
PSICP	Program Support Inventory Control Point
PTD	Provisioning Technical Documentation
SCN	Ship Construction Navy
SECNAV	Secretary of the Navy
SHAPM	Ship Acquisition Project Manager
SIMSL	Shore Intermediate Maintenance Stock List
SM&R	Source, Maintenance and Recoverability Code
SRASL	Selected Restricted Availability Stock List
SRI	Store Room Item
TARSL	Tender and Repair Ship Load List
TRF	Technical Replacement Factor
UICP	Uniform Inventory Control Point
WSF	Weapon System File

I. INTRODUCTION

A. BACKGROUND

The 1980's have seen an unprecedented peacetime acquisition of military hardware in the Department of Defense (DOD). For the Navy this growth has included an ambitious and aggressive assortment of ship, aircraft and weapon systems acquisition programs. The purpose of these programs has largely been to return the Navy to a 600 ship force and equip those ships with the most capable weaponry and support systems available from current technology.

The business of buying and fielding naval weapons systems, ships or aircraft is complex. The time horizons of major system procurements are long; the process is technically challenging and administratively cumbersome; the decision making is complex; the goals conflicting; and the environments; political, military, and economic, are constantly changing.

Within the arena of major military acquisitions the Navy's Hardware Systems Commands (HSCs) have central responsibility for major hardware acquisition and program management. The HSC is responsible for coordination of the myriad of activities associated with the procurement and delivery of military hardware to the operating forces. Included in the HSC's responsibilities is the planning and

implementation of Integrated Logistic Support (ILS) systems. These ILS systems provide maintenance and logistic support for equipment throughout the systems life cycle.

A weapons system ILS plan includes many elements. Among them are; configuration management, maintenance planning, training, technical documentation and repair and spare parts support. The development and implementation of the ILS plan by the HSC requires the assistance and coordination of a number of support activities including the Program Support Inventory Control Point (PSICP). It is the Inventory Control Point's responsibility to develop the spare and repair part allowance lists, buy supply system and allowance list material and maintain worldwide repair part inventories to support equipment.

The acquisition strategies and policies used by the Navy to procure major equipments and their associated repair parts have received increased attention and criticism in recent years. This criticism has identified many problems in the way the DOD and the Navy buy equipment, services, spares and repair parts. In response to these problems a variety of programs and policy changes have been implemented to improve the manner in which the armed services buy their equipment and support material.

Within an environment of increased demand for Navy hardware, accelerated acquisition programs, and skepticism regarding the effectiveness and efficiency of military

procurement and inventory management practices the HSC and supporting activities must field new weapon systems, ships and aircraft in a timely and effective manner.

B. OBJECTIVES

Recent Ship Construction Navy (SCN) shipbuilding programs (including the FFG-7, SSN-688, and CG-47 classes) have experienced an increasing accumulation of excess outfitting materials resulting from the allowance development process. The quantity of excess material on hand is difficult to estimate, in part because all ship construction program managers handle excess outfitting materials differently. It has been estimated that between 10 and 20 million dollars of residual assets are generated annually among shipbuilding programs. Although these figures seem unusually high, significant excesses do result from current outfitting procedures. [Ref. 1]

The FFG-7 Shipbuilding program has centralized the inventory control of it's residual assets. In July 1986 the FFG-7 program had roughly 14,000 line items valued at 7 million dollars of excess material on hand in it's warehouse [Ref. 2] The FFG-7 program has attempted to manage and use it's residual assets effectively. However, the cost of maintaining warehousing services is high (currently about \$200,000 per year).

Other shipbuilding programs (SSN-688, CG-47, CVN) have similar residual asset difficulties. The sum of all shipbuilding program excess outfitting material suggests that substantial benefits are possible from a review and modification of the allowance development and computation programs from which residual assets emerge.

The Navy's method of developing initial allowance lists and outfitting newly constructed ships is based on the Incremental Stock Number Sequence List (ISNSL) process. The ISNSL process is considered by NAVSEA and NAVSUP to be a major cause of excess or residual outfitting material. [Ref. 1]

The ISNSL program is part of the Uniform Inventory Control Point (UICP) system executed by the Ships Parts Control Center (SPCC). Broadly, UICP is a large set of automated inventory and financial management programs designed to determine supply support requirements and manage the Navy's supply system. The ISNSL process embodies the allowance development, outfitting and logistics policies of the DOD, SECNAV, CNO and the Hardware Systems Commands.

Numerous point papers regarding SCN excess outfitting material have been written for the Navy's logistics community since 1984. Many of these papers have served the purpose of identifying problems with current SCN outfitting procedures and alerting logistics managers in the Navy of the problems. The following discussion outlines current

efforts to research and correct the accumulation of residual assets during initial ship outfitting.

1. NAVSEA Incremental Stock Number Sequence List Task Force

In September 1985 the Naval Sea Systems Command convened a Task Force to study the ISNSL's affects on excess outfitting material. The Task Force was formed in response to several point papers regarding ISNSL churn. ISNSL churn can be simply defined as spares/repair parts being added to allowance on an early ISNSL and being disallowed on later ISNSLs. ISNSL churn is discussed in detail later. The primary purpose of the initial Task Force meeting was to develop a research agenda on issues that contribute to changes in ISNSL allowance quantities from one listing to the next.

Participation in the initial meeting included representatives from NAVSEA, NAVSUP and SPCC. Task Force topics included discussion of the following; 1) the impact of shifting supplier codes (GF to CF or vice versa) on ISNSL churn, 2) the use and effectiveness of the ISNSL residual assets routine, 3) the effects of re-provisioning on ISNSL churn, 4) the effects of erroneous configuration and configuration changes on ISNSL churn, 5) the effects of BRF updating on ISNSL churn and 6) the administrative costs and burden of processing excessive ISNSL adjustments. [Ref. 2]

Although several action items were assigned as the result of the initial ISNSL Task Force meeting, few have been completed to date. A follow-on meeting has not been convened. It appears that efforts by the Task Force to correct ISNSL churn/excess outfitting material problems have been limited to a forum for problem discussion.

2. Fleet Material Support Office (FMSO) ISNSL Churn Study

In May 1986 the Fleet Material Support Office (FMSO) began the study of ISNSL churn for SPCC and NAVSUP. The FMSO study concentrates on the impact of changes in Best Replacement Factor (BRF) and ship's configuration on ISNSL churn. The study will attempt to identify the causes of ISNSL churn and recommend alternative methods for ISNSL computation and processing. Based on data availability and study methodology, results will be available in May 1987. [Ref. 3]

With concern over Navy inventory management and procurement practices, the primary purpose of this thesis is to review the new construction ship allowance development process, policies and programs. The ISNSL process and the ISNSL products of several FFG-7 and SSBN-726 class ship's will be reviewed in detail in an effort to discover the causes of excess allowance materials accumulated during the SCN allowance development and outfitting period and recommend policy or program modifications.

C. RESEARCH QUESTION

The primary research in this thesis attempts to identify relationships between excess allowance materials accumulated during the Ship Construction Navy (SCN) outfitting process and the Navy's programs, methods and procedures for determining those allowances. The Uniform Inventory Control Point (UICP) Incremental Stock Number Sequence List (ISNSL) is the primary source of authorized allowance list material for SCN shipbuilding programs.

The ISNSL has been identified as a major cause of outfitting material excesses. [Ref. 1] ISNSL churn is the computation of an item for allowance in an ISNSL on a given date and the subsequent increase or decrease the the item's stockage depth , in the computation of a later ISNSL. The ISNSL relies on data from a number of sources, both internal and external to the UICP system, for the computation of allowance lists. In many ways the ISNSL represents the culmination of a series of processes and steps in the overall allowance development effort.

The computation of the allowance for a single repair part relies on several factors. These factors are determined throughout the allowance development process and considered within the ISNSL program. Therefore, to some degree the source of ISNSL churn lies not within the ISNSL

process itself but rather within the information and sub-processes which proceed it. This research will therefore attempt to identify which factors and portions of the allowance development and ISNSL process contribute the most to the accumulation of excess materials during the SCN outfitting period.

Secondary questions addressed by the research include the following:

- 1) The ISNSL programs and the allowance development process in general represent an implementation of Department of Defense and Department of the Navy policies on initial secondary item outfitting and allowance development. To what extent do these policies contribute to the problem of accumulated excess outfitting material?
- 2) The Navy has several ongoing shipbuilding programs. What is the estimated cost or value of the excess materials or "residual assets" as they are sometimes referred to? What is the current method of handling and disposing of these materials?

D. SCOPE AND LIMITATIONS OF RESEARCH

This thesis is limited to the allowance development process used for shipbuilding programs managed by the Naval Sea Systems Command (NAVSEA). It is further limited to only those programs for which the Navy Ships Parts Control Center

(SPCC) is the Program Support Inventory Control Point (PSICP).

The primary source of data for this thesis was ISNSL summary statistics and reports for FFG-7 and SSBN-726 class shipbuilding programs obtained from the Ships Parts Control Center, Mechanicsburg, PA. A research visit to SPCC permitted data collection and interviews with allowance development personnel and ISNSL system analysts.

E. RESEARCH APPROACH

The research for Chapter II was confined largely to Navy instructions, directives, and Military Standards pertaining to allowance development procedures. Chapter II provides a broad perspective from which to view the allowance development process and the key issues regarding excess allowance materials. Chapter II sets the stage for an understanding of the data analysis which follows. The research for Chapter IV was based on the ISNSL records of FFG-7 and SSBN-726 class ships. An analysis of this data is performed to isolate those factors which have the greatest impact on ISNSL churn and the excess allowance materials that result. Multiple linear regression, variance analysis and mean comparison statistical tests are the primary tools of this analysis. The regression analysis attempts to describe the relationship between ISNSL churn (the dependent variable) and equipment configuration and Best Replacement

Factor (BRF) adjustments (the independent variables). Variance analysis and mean comparison testing attempt to determine the following:

- 1) If any difference in ISNSL churn exists between allowance material categories (government furnished, contractor furnished, storeroom items, and operating items).
- 2) If ISNSL churn is affected by annual Best Replacement Factor (BRF) updating.

II. THE SHIP CONSTRUCTION NAVY (SCN) ALLOWANCE DEVELOPMENT PROCESS

Chapter I introduced the Navy ship acquisition and allowance development process as a complex system functioning within an equally complex environment. Determining initial levels of spare and repair parts stockage for new weapon systems has far reaching affects on readiness. The intent of that process is to provide the best possible logistic support consistent with DOD and Navy policies and funding limitations. The fact that extensive excess outfitting materials accumulate over the course of Navy shipbuilding programs indicates that the manner in which initial allowances are determined needs review.

The purpose of this chapter is to introduce the major factors in the new construction allowance development process. These factors include:

- a. Provisioning
- b. New construction allowance development
- c. New construction configuration development.

The above activities represent much of the effort in determining the supply support needs of a new ship. These activities are not necessarily sequential. They may be best characterized as iterative, and often parallel in nature. The responsibility for determining shipboard allowances is

divided among several activities. Therefore, the responsibility for completing the above action is equally divided.

It is not intended that the following sections provide a comprehensive discussion of the SCN allowance development process. Rather, this chapter is intended to introduce the concepts necessary to understand and appreciate the complexity of the new construction allowance development process.

A. PROVISIONING

New equipments are continually being procured by the Navy to upgrade Fleet operational capabilities. These equipments are usually procured by the Hardware Systems Command (HSC) and installed on both new ships and existing fleet units. These new equipments must be supported by the Navy supply system to maintain Fleet readiness. Navy supply support for new hardware is achieved through the provisioning process. The provisioning process is a joint effort involving the equipment contractor, the HSC, the In-Service-Engineering-Activity (ISEA) and the Navy Ships Parts Control Center (SPCC).

Provisioning is a time consuming process. Often the time required to fully provision equipment and attain complete Navy supply system support exceeds the time

required to procure, install, checkout and place a new item of equipment in operation on fleet units.

The provisioning process consists of four major phases. These are:

- a. Logistic Support Analysis (LSA) and Provisioning Technical Documentation (PTD) development by the contractor
- b. Technical coding of the PTD by the HSC or ISEA
- c. Supply management coding, Allowance Parts List development (APL), and wholesale and retail requirements determination by SPCC.
- d. Procurement Lead Time (PLT). In the past, PLT has not been considered a phase of the provisioning process. Rather, PLT was viewed as part of the contracting function only. As procurement lead times have generally increased, the need to broaden the perception of the provisioning process and manage both allowance determination and allowance material acquisition was recognized.

For complex weapons systems the full provisioning process frequently exceeds 36 months [Refs. 4,5,6]. Each of the phases is discussed in the following paragraphs.

1. Logistic Support Analysis

A Logistic Support Analysis (LSA) is a logistic and engineering analysis performed on an item of equipment or weapon system as part of the system acquisition and design

process. MIL-STD 13881A is the reference document for LSA procedures. It develops a structured engineering approach to the design of an affordable, supportable, maintainable and operationally effective population of equipment. The LSA approach recognizes that maintainability and supportability variables are critical factors in weapon system effectiveness and life cycle costs. The largest portion of equipment life cycle costs are associated with maintenance and support of equipment after initial acquisition. Recognizing the impact of maintenance and support requirements on overall equipment life cycle costs, the LSA attempts to influence equipment design to minimize logistic and maintenance support needs and reduce life cycle costs.

Historically, maintenance and support needs were addressed only after hardware engineering requirements were filled. This approach often resulted in a well engineered piece of hardware that wasn't maintainable or supportable. By adopting an equipment design philosophy where logistic support, maintenance, reliability, and other engineering concerns are on equal ground, significant improvements in equipment operational effectiveness can be achieved while reducing life cycle costs.

The purpose of the LSA is to integrate logistic support, maintenance and engineering design considerations in the final hardware design. An LSA is an iterative

analysis process implemented in the earliest phases of the equipment acquisition. It is a systematic procedure for reviewing engineering proposals against support requirements. It performs the tradeoff analysis necessary to arrive at the best equipment design to fulfill operational needs while minimizing support requirements and life cycle costs. [Ref. 7]

2. Provisioning Technical Documentation

Provisioning Technical Documentation (PTD) is descriptive information purchased from the equipment manufacturer. PTD is used by the Navy to develop equipment Allowance Parts Lists (APLs) and to load data into associated UICP files.

PTD takes a variety of forms, based on the complexity of the equipment being provisioned and the contractual requirements of the acquisition. PTD for a simple valve or switch may be limited to a few drawings and a manufacturer's parts list. Major weapons system PTD contains all the documentation necessary to identify each component and piece part contained in the equipment, catalogue each item and assign a Nation Stock Number (NSN) or identify the item to a previously cataloged NSN, determine repairability status and estimated failure rate.

Military Standards 1561B and 13882A (MIL-STD 1561B and MIL-STD 13882A) set forth broad provisioning procedures and technical information requirements. MIL-STD 1561B,

Uniform DOD Provisioning Procedures, describes the terms and conditions governing the Department of Defense equipment provisioning process and delineates the responsibilities of the contractor with regard to provisioning. MIL-STD 1561B is primarily a reference document which forms the baseline for provisioning requirements and procedures.

MIL-STD 13882A, Department of Defense Requirements for a Logistic Support Analysis Record, prescribes the format and preparation instructions for PTD and the definition of all provisioning data elements to support the LSA and the follow-on provisioning effort. MIL-STD 13882A replaced MIL-STD 1552 (Uniform DOD Requirements for Provisioning Technical Documentation) as the source document for PTD content and format with the requirement to perform a Logistic Support Analysis (LSA) on major equipment. [Refs. 8,9]

MIL-STD 1561B and 13882B are used by the Navy to develop a Provisioning Requirements Statement (PRS) and a Provisioning Performance Schedule (PPS) for each major equipment acquisition. The PRS and PPS are contained or referenced within the equipment procurement contract.

In an effort to standardize the provisioning requirements across ship equipment acquisitions, the Naval Sea Systems Command (NAVSEA) developed a standard provisioning reference document for all NAVSEA procurements. The NAVSEA Logistic Support Analysis Provisioning

Requirements for Shipbuilding and Conversion Contracts (NAVSEA TL490-AG-GTP-010) provides the needed guidance on LSA and provisioning procedures and PTD requirements for shipbuilding, conversions and major system contracts. From the NAVSEA standardized document, individual PRS and PPS are prepared for specific shipbuilding or equipment procurement contracts. The NAVSEA PRS standard acts as a "fill in the blanks" menu to assure minimum provisioning procedures and data needs are fulfilled. [Ref. 7]

The importance of provisioning technical documentation extends well beyond it's impact on the initial provisioning process. Provisioning documentation forms the database of technical descriptive information for spare and repair part replenishment during the equipment life cycle.

The technical documentation submitted for initial provisioning is required for cataloging, identification of the Original Equipment Manufacturer (OEM), identification of secondary or substitute manufacturers and other procurement needs. Additionally, emphasis on competition in the buying of spare parts has renewed the interest in adequate PTD. The ability to competitively procure repair parts is often dependent on the extent to which adequate detailed technical information exists which fully describes the item desired. The availability or absence of this technical data is frequently a result of the equipment's initial acquisition

and the PTD requirements spelled out within the acquisition contract. [Ref. 5]

3. Technical Coding

The technical coding phase is the process whereby the Hardware System Commands overlays the PTD with the equipment's maintenance strategy. The equipment maintenance strategy reflects the HSC's desires regarding how the equipment is to be maintained, repaired and supported. The maintenance strategy identifies the level of repair (organizational, intermediate or depot) to be used for each maintenance action and whether the equipment will be primarily supported by piece parts or modules. The maintenance strategy is a major by-product of the LSA and it affects manpower, training, parts support and technical data requirements.

Technical coding is typically performed by an HSC's designated engineering support activity. These activities are known as In-Service Engineering Support Activities (ISEAs). When performing technical coding or other provisioning functions on equipment for which they have technical responsibility, they are referred to as Provisioning Engineering Support Activities (PESAs). Major NAVSEA ISEAs with provisioning functions include:

- a. Naval Sea Logistic Support Engineering Activity (Hull, Mechanical and Electrical equipment)
- b. Naval Ordnance Station Louisville (NAVSEA Gun Systems)

- c. Naval Ships Systems Weapons Engineering Station (NAVSEA Ship Missile Systems)
- d. Naval Undersea Systems Center (Antisubmarine Warfare Weapon Systems).

An example of the technical coding performed by the HSC or ISEA/PESA is the assignment of Source, Maintenance and Recoverability Codes (SM&R Codes) and Technical Replacement Factors (TRFs). The SM&R code is a 5 digit alpha-numeric code assigned to each repair part and component within an equipment. The SM&R code is the primary way in which the technical and maintenance factors of the HSC's equipment maintenance strategy are translated into specific supply support guidance. The SM&R code plays an important part in the allowance development process as it identifies items within the capability of the ship to remove and replace. The SM&R code thereby determines the parts which are candidates for onboard allowance.

The TRF is an estimated annual failure or replacement rate which is assigned to new items during the provisioning process. The TRF is based on technical, engineering and logistic judgment and is refined over time with actual usage information. The TRF becomes a Best Replacement Factor (BRF) after an item has been in the supply system long enough to establish a demand pattern. The period of time needed to establish a demand pattern is known as the demand development period. The demand

development period is usually one to two years. The TRF or BRF are important factors in the allowance development process and are more fully discussed in section E. [Ref. 10]

The major questions answered by the technical coding process and embedded within the SM&R and TRF codes are:

- a. Should a part be stocked in the Supply System?
- b. Who can replace the part?
- c. Who can repair the part?
- d. Who can authorize the part's disposal?
- e. What is the part's estimated failure rate?
- f. What is the part's importance to the parent equipment?
- g. Is the part required to perform preventative maintenance?

The SM&R code contains four pieces of information. The first two characters within the SM&R code are the source code. The source code indicates how the item is to be obtained. For example, the source code can indicate that the item is stocked within the supply system and should be requisitioned via normal channels, is assembled or manufactured locally from other materials or is ordered as part of a kit.

The next two characters are the maintenance code. The maintenance code indicates if the item is replaceable at the organizational (shipboard), intermediate (tender/SIMA) or depot level. Additionally, the maintenance code

indicates the maintenance level authorized to repair the part or component.

The last character of the SM&R code is the recoverability code. This code identifies the maintenance activity authorized to throw the item away. For repairable components this is usually the depot level. [Ref. 5]

4. Supply Management Coding and Allowance Parts List (APL) Development

In it's simplest terms, provisioning is the function of determining the range and depth of spares and repair parts needed to provide initial supply support for a new or modified equipment. Provisioning is a continuous and iterative process and represents the translation of contractor's technical data and the Hardware Systems Commands maintenance philosophy into equipment supply support in the form of onboard allowances and wholesale system stock. The provisioning process begins at the time a new equipment is identified for Navy use and continues until the equipment is phased out of service. In some sense provisioning includes; developing logistic support policy, stockage levels determination, and the purchasing of spares and repair parts. The concept of provisioning is a dynamic cycle. This cycle is repeated with each new equipment, and with each design change or improvement. Figure 1 illustrates the nature of the provisioning cycle. [Refs. 4,5,11]

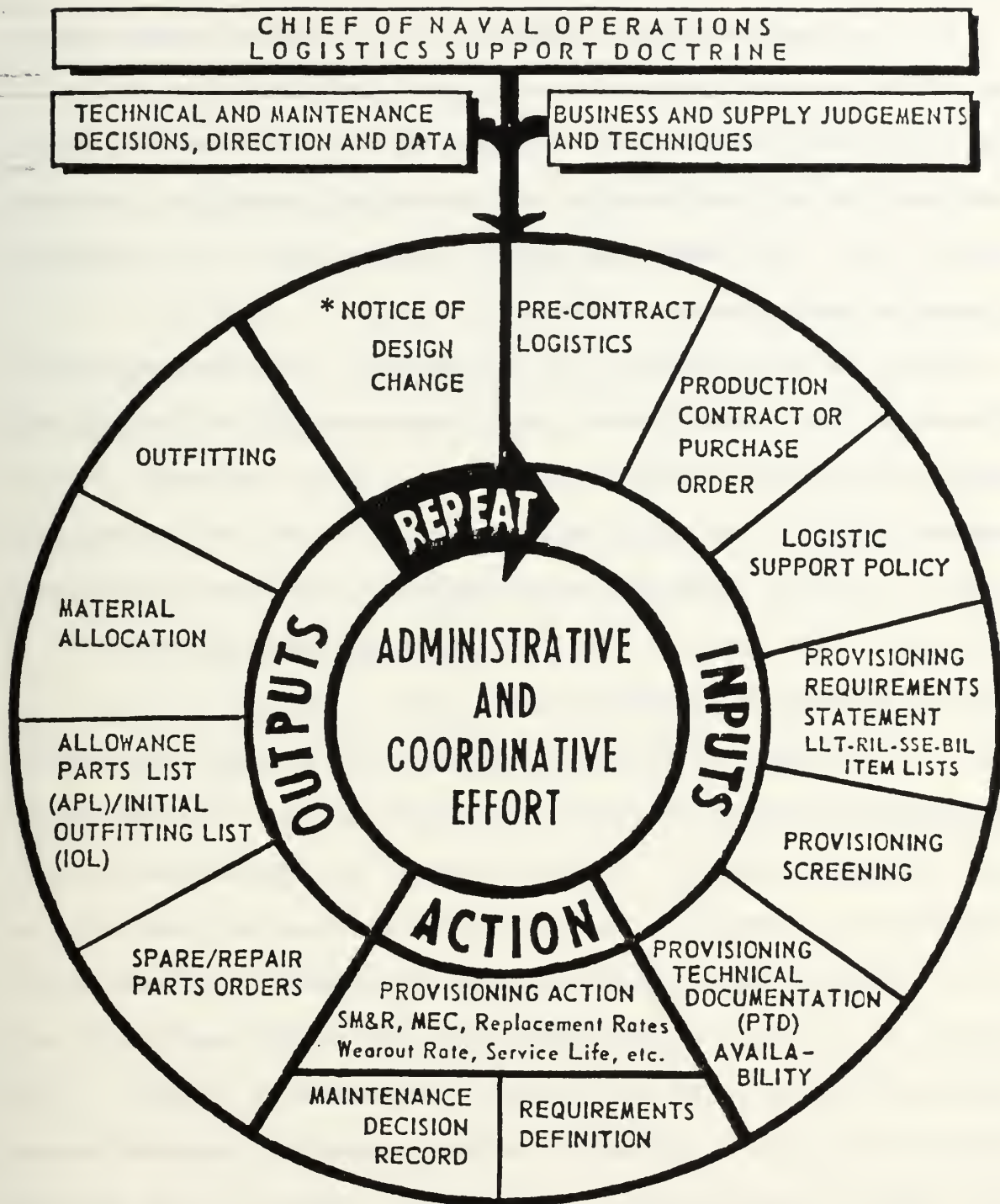


Figure 1. Provisioning Cycle

B. ALLOWANCE PREPARATION

The purpose of this section is to review the policies and criteria used in developing shipboard allowance levels. The supporting policy for afloat spare and repair part inventory levels will be discussed along with the Navy's methods of implementing policy guidelines in specific allowance determination methods.

Prior to discussing the rules and requirements for allowance list development, an understanding of some major Inventory Control Point (ICP) files is required. The Weapons Systems File (WSF), Master Data File (MDF), Program Support Interest File (PSI) and Technical Reference File are the major files used in the allowance development process.

1. Weapons Systems File

The Weapon Systems File is the master equipment configuration data base for all Navy ships. The WSF is a multi-level data base. The upper level of the WSF, commonly referred to as Level A, contains ship configuration data.

The building block of an equipment configuration record is the APL number assigned to each equipment or component during the provisioning process. Level A is basically an index of the installed equipment/components by APL number on each ship. The lower level of the WSF is referred to as Level C. Level C is an index of all repair parts contained within an equipment or component. In summary, WSF Level A is a record of equipment on the ship,

while WSF Level C is a record of repair parts in each item of equipment. Figure 2 shows WSF relationships.

The WSF also contains an intermediate level known as level B. Level B is used primarily for electronic and ordnance equipment to describe subcomponent structures and is of no relevance to this research [Ref. 5]

Shipboard allowance lists cannot be developed without using the configuration information from the WSF. For new construction programs Level "A" is primarily loaded by the shipbuilding supervisory activity or other activities designated by the Project Manager. Level "C" is loaded primarily through the provisioning process.

2. Master Data File

The Master Data File (MDF) is the principle inventory management file for SPCC managed items. The MDF contains roughly 500,000 records and is indexed by National Item Identification Number (NIIN). MDF records are established by the provisioning and cataloging processes. Inventory and procurement data is established and maintained in the MDF by other UICP software applications.

Each record within the MDF has in excess of 300 possible data element entries. These data elements include single entry items (e.g. price, cognizance symbol and replacement factor) and numerous trailers which contain multiple entry, optional or repeating information (e.g., application data, part number cross reference information).

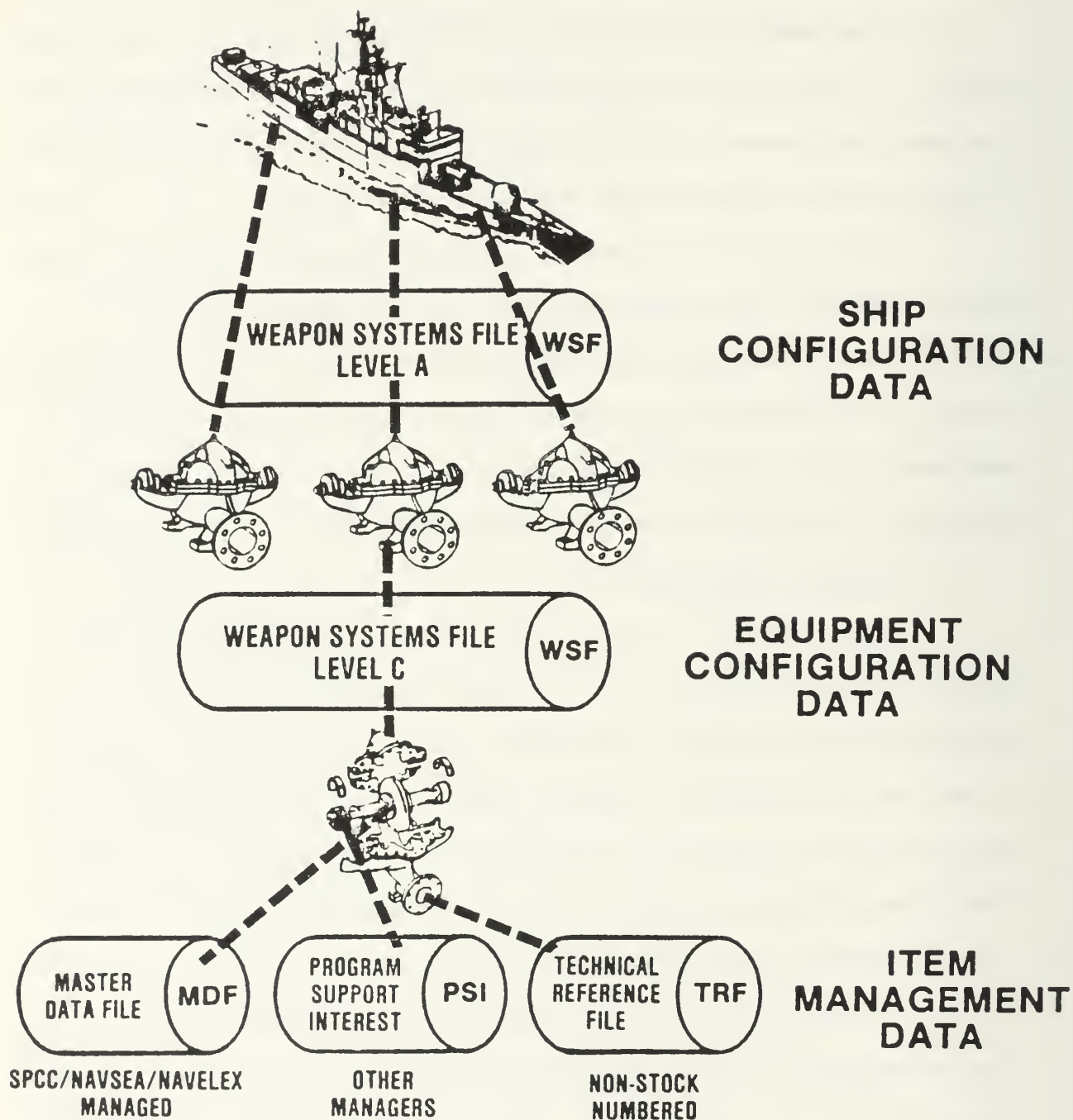


Figure 2. Weapon Systems Structure

The MDF is not a static file. Typically, the MDF experiences from 750,000 to 1.5 million maintenance transactions monthly. This database volatility may have significant effects on the allowance development process.

3. Program Support Interest File

The Program Support Interest File (PSI) is similar to the MDF. The PSI contains records for repair parts installed on ships supported by SPCC which are managed by other Inventory Control Points. The PSI contains virtually the same item management information as the MDF except inventory status information. The PSI is initially loaded during the provisioning process and maintained via a data exchange with the controlling ICP.

4. Technical Reference File

The Technical Reference File is also similar in structure to the MDF and PSI. There are two types of Technical Reference File items; deleted stock numbers and technical reference items. Both of these types of items are significant for maintenance and support. When an ICP decision is made to delete an item from the MDF or PSI, the cataloging and files maintenance process moves the item to the Technical Reference File. The record remains on the file for information purposes, should future demand or applications require the management data associated with the item. This part of the file is known as the inactive Technical Reference File. Inactive items do not appear on

allowance documents and are not candidates for onboard stockage.

The active Technical Reference File contains technical data on maintenance significant items for which there is no predicted demand. Items from the active file can appear on allowance documents as a reminder that they exist and may need to be maintained, but they are not intended for stockage since their failure rates are usually assumed to be zero. [Refs. 5,11]

5. Coordinated Shipboard Allowance List

The Coordinated Shipboard Allowance List (COSAL) implements the Chief of Naval Operations (CNO) shipboard allowance policies. Few processes have more impact on the logistic support of U. S. Navy ships than the COSAL development process. Even with it's recognized importance, the COSAL process remains misunderstood.

Although the Ships Parts Control Center (SPCC) produces and distributes the COSAL, many other activities play key roles in determining the COSAL's quality and value. Hardware Systems Commands (HSCs), Shipyards, Ship Acquisition Project Managers (SHAPMs), Supervisor of Shipbuilding (SUPSHIPS), In-Service-Engineering-Activities (ISEAs) and the Inventory Control Points (ICPs) all have significant roles in the allowance development and COSAL process. [Refs. 4,10]

The COSAL is the primary source of spare and repair parts support for ships. The COSAL is tailored to each ship individually and reflects the support needs of the equipment and components currently installed. It is designed to support the organizational level maintenance. The COSAL allowance is a stockage at the consumer level of inventory.

Levels of inventory and levels of maintenance are separate concepts and need further explanation. Levels of inventory are defined by the Department of Defense as follows:

- a. Consumer Level of Inventory: An inventory, regardless of funding source, usually limited in range and depth, held by the final element in an established supply distribution system for the purpose of internal consumption. (Consumer level inventories are developed for use by the activity holding the inventory. They have no resupply or replenishment functions for lower levels of inventory, as there are no lower levels.) [Ref. 5]
- b. Intermediate Level of Inventory: An inventory, regardless of funding source, that is required between the consumer and wholesale levels of inventory for support of a defined geographic area or tailored to support a specific set of consumer organizations or activities. [Ref. 5]
- c. Wholesale Level of Inventory: An inventory, regardless of funding source, over which an inventory manager at

the national level has asset knowledge and exercises unrestricted asset control to meet worldwide inventory management responsibility. (The primary purpose of wholesale inventories is the replenishment of lower level inventories, both intermediate and consumer.)

[Ref. 5]

Levels of maintenance refer to the activity designated to accomplish particular maintenance tasks on an equipment or component. Generally, the more complicated and extensive the maintenance task, the higher the maintenance activity required. For example, routine preventative maintenance is generally performed by organizational (shipboard) personnel. Routine equipment calibration requiring special test equipment is generally done by the intermediate level (tender, repair ship or SIMA). Extensive equipment overhaul is accomplished at the Depot level accomplishment (shipyard, DOP or commercial activity). [Refs. 12,13]

The COSAL is the U. S. Navy's method of determining stockages at consumer level inventories to support afloat organizational level maintenance. Figure 3 shows the levels of inventory, levels of maintenance and the method of determining their support requirements.

The Chief of Naval Operations' policies on shipboard inventories are defined in OPNAVINST 4441.12B. Within 4441.12B the framework and requirements for afloat spare and

repair parts allowances are developed. The fundamental concepts contained within this guidance are:

- a. The shipboard allowance document will fully describe installed systems and equipment.
- b. Mandatory range and depth of spare and repair parts will be prescribed.
- c. The allowance document will be responsive to changes in demand.

Level of Inventory	Level of Maintenance		
	Organizational	Intermediate	Depot
Consumer (Afloat)	COSAL	TARSLL	Shop Stores & SRASL
(Ashore)	COSBAL	SIMSL	
Intermediate	Geographical Operation Support Inventory (GEOSUP) Fleet Issue Load List (FILL)		
Wholesale	World Wide Support		Depot Level Provisioning

Figure 3. Inventory, Maintenance Levels and the Associated Stockage Lists

- d. The allowance document will reflect the essentiality of each equipment/component in it's method of computation.
- e. The allowance document will provide 90 percent protection against stockout for a 90 day period for demand based items. [Ref. 14]

A discussion of demand based and non-demand based allowance items will be included later.

6. Fleet Logistic Support Improvement Program

With OPNAVINST 4441.12B identifying the fundamental requirements of shipboard allowances the COSAL process and supporting computation methods were developed to satisfy these needs. The Fleet Logistic Support Improvement Program (FLSIP) was developed in response to the policy guidance set forth by CNO. The FLSIP concept determines shipboard allowance levels by considering the following major factors:

- a. Ship maintenance capability
- b. Total ship equipment configuration and total equipment repair parts population
- c. Each repair part's failure rate (commonly referred to as a part's Best Replacement Factor or BRF).

The term FLSIP is also applied to the basic mathematical model used by the FLSIP program. The FLSIP model determined most shipboard allowances during the 1970's and early 1980's.

The straightforward FLSIP model is being phased out by the MODFLSIP model as the primary computational method for shipboard allowances. However, the FLSIP concept forms the basis for current computational methodologies and an understanding of it is useful. The following is a discussion of the basic FLSIP concept and the FLSIP computational model.

The FLSIP concept involves three essential considerations:

- a. Replaceability
- b. Likelihood of need
- c. Importance.

The first consideration, replaceability, means that the ship must have the capability to remove and install a part before that part will be considered for onboard stockage. This consideration is a direct result of the maintenance and support strategy developed by the Hardware Systems Command for the installed equipment and the ship as a whole. This maintenance strategy is applied to each repair part by the technical coding performed during the provisioning process. If the ship doesn't have the trained personnel, special tools/test equipment and technical documentation aboard to remove and install a part, it makes no sense to stock the part. [Ref. 10]

The second element of the FLSIP concept, likelihood of need, involves both economic and storeroom space considerations. Clearly, a ship cannot stock one of everything within its storerooms. If this were the allowance criteria, Navy ships would have to be twice the size they are to accommodate all their spares, and there would be half as many ships because of the cost of the stocked parts. Because of these physical and economic limitations the replacement rate reflected in an items Best

Replacement Factor (BRF) is a central determinate of onboard allowance. The replacement rate of a part, multiplied by the total number of this part installed onboard, determine the likelihood that a part will be needed. [Ref. 10]

The last FLSIP consideration, importance or military essentiality, involves a judgment regarding the importance of the repair part to the operation of the equipment within which it is installed. If items are not important to the ship's installed equipment or mission then scarce dollars and onboard stowage space should not be invested in them. The concept of importance and mission essentiality was poorly addressed by the basic FLSIP computation model and is the primary reason it is being replaced by a second generation of allowance development algorithms. [Ref. 10]

The FLSIP computation process begins with an examination of all allowance candidate items for a ship. The allowance candidates are determined by extracting the ship's configuration data from the WSF level A and equipment to repair part information from the WSF level C. Each repair part within the ship's maintenance level is then summed with all other identical parts to develop a total ship's allowance candidate list. Only those items authorized to be replaced onboard are selected by the FLSIP process as candidates.

Once the allowance candidate list has been developed, it is passed through the FLSIP demand qualifier

program. The total installed part population on the ship (obtained by multiplying the equipment population by the part population per equipment) is multiplied by the part's Best Replacement Factor (BRF). The resulting quantity is then compared with the "demand based" and "insurance based" item criteria established by CNO policy.

For basic FLSIP, if the expected part usage is greater than or equal to four parts per year, (total ship's population times BRF greater than or equal to 4) the item is then considered demand based. An allowance quantity is computed for each demand based item which provides a 90 percent protection against stockout for a 90 day period.

If the part's usage is less than four per year and both the part and the equipment on which it is installed are coded vital then the candidate item is passed to the insurance items program. Each remaining candidate is then screened to determine if the part's expected usage meets the CNO criteria for insurance stockage. If the candidate item has an expected usage of at least one every four years (population times BRF greater than or equal to 0.25) it is selected under basic FLSIP as an insurance item for onboard stockage.

Unless the remaining candidate items are identified by specific mission, maintenance or safety override codes as required for stockage, they are rejected for onboard stockage. Because the straightforward FLSIP allowance

computation technique provides onboard allowances for virtually all items with total shipwide usage of one every four years (population times BRF greater than or equal to 0.25) it is commonly known as the .25 FLSIP computation method. [Refs. 5,10]

The shipboard stockage allowances determined by the COSAL process result from a snapshot of the configuration and management data within the WSF, MDF, PSI, and Technical Reference File and other allowance significant UICP files. Because of the dynamic nature of these files successive allowance computations on a single ship's configuration would result in different stockage allowances.

The CNO's performance objectives for COSAL allowances are to fill 65 percent of all repair part demands from onboard stock (gross effectiveness) and 85 percent availability for onboard allowance items (net effectiveness). The gross effectiveness goal means that 65 times out of 100 the shipboard repairman should find the needed repair part in the ship's storeroom. The net effectiveness goal means that if the required repair part is an onboard stockage allowance item, then 85 times out of 100 it should be onboard when needed. The monitoring of COSAL effectiveness throughout the fleet has indicated that actual COSAL performance is closer to 50 percent gross effectiveness. [Ref. 15]

7. Bagby Study

In 1972, as a result of poor COSAL performance and a concern over the level of supply support being provided, the CNO sponsored a study of afloat logistic support performed by the Center for Naval Analysis. [Ref. 15]

The Center for Naval Analysis study, known as the Bagby study, identified some major shortcomings in the way the Navy determined shipboard allowance levels. As a result of the Bagby study, several changes to CNO allowance development policy and COSAL computation methods were recommended.

Among the most significant findings of the CNA study was that existing allowance development methods were unable to distinguish between the support requirements for mission essential equipment and equipment of lesser importance. What this meant was that the .25 FLSIP model treated all equipment the same. The .25 FLSIP model applied the same allowance criteria to both mission critical equipment (e.g., missile, gun, and propulsion systems) and equipment of lesser criticality (e.g., laundry and galley equipment). Given that there are both economic and stowage constraints on shipboard stockage allowances, treating all equipment equally, regardless of mission essentiality, does not make sense.

The Bagby study also suggested that COSAL effectiveness may not be the best measure of COSAL

performance. The main objective of any level of inventory within the Navy is to improve fleet readiness. Therefore an appropriate measure of effectiveness for the Navy's supply (and inventory) system is how well it supports those equipments which degrade readiness.

The most significant changes to the COSAL process resulting from the Bagby study involved developing a system which recognizes and provides greater support for mission critical equipment. The MOD-FLSIP (Modified Fleet Logistic Support Improvement Program) and MCO (Maintenance Criticality Oriented) computation methods were developed to fulfill the needs identified by the Bagby study.

Figure 4 summarizes the major COSAL models. For all models, "u" represents the item population's expected annual replacement rate, "POP" is the item population, "RF" is the item's annual replacement rate (BRF or TRF), and "AQ" is the item's allowance quantity.

In the MODFLSIP model, Mission Criticality Code (MCC) is a measure of item importance and ranges from 1 (least important) to 4 (most important). For FLSIP and MODFLSIP models, demand based item ($u > 4$) allowance quantities are always the expected number of replacements during a 90 day period ($u/4$), plus a fixed protection level ($1.28 \times \sqrt{u/4}$). This fixed amount provides the 90% probability against stock-out for a 90 day period. Because

FLSIP and MODFLSIP provide a fixed protection level against stock out, they are known as fixed protection models.

Trident and MCO techniques are variable protection level models. The allowance quantities computed by these models equal the expected 90 day replacements ($u/4$), plus a variable protection level based on item importance and price. The variable protection level is represented by t in the trident model and Z in the MCO model. In the Trident model, Mission Essentiality Code (MEC) is a measure of item importance and ranges from 95 (least important) to 116 (most important). In the MCO model, Maintenance Criticality Code (MCC) is a measure of item importance and ranges from 1 (least important) to 4 (most important).

MCC is a common acronym between MODFLSIP and MCO models. With both models, the MCC serves the same purpose, to stratify allowance item candidates by mission importance. However, MODFLSIP MCCs and MCO MCCs are not the same thing.

MODFLSIP Mission Criticality Codes are derived from the Navy's Casualty Reporting (CASREP) system. MODFLSIP MCCs are assigned to ship class/equipment combinations based on the mission impact of the equipment failure. MODFLSIP MCCs are maintained in the MCC matrix file at SPCC by NAVSEALOGSUPENGACT.

MCO Maintenance Criticality Codes were developed for the FFG-7 ship class based on its unique maintenance strategy and a shipwide logistic support analysis. The MCO

MCCs are maintained in the FFG-7 database by the Navy Maintenance Support Office (NAMSO).

Name	Equation	Conditions
FLSIP	$u = POP \times RF$ $AQ = 1$ $AQ = u/4 + (1.28 \times \sqrt{u/4})$	$.25 \leq u \leq 4$, item coded V1 (vital) $u > 4$ 90% probability of no stock out in 90 days
MODFLSIP	$u = POP \times RF$ $AQ = 1$ $AQ = 2$ $AQ = 2$ $AQ = u/4 + (1.28 \times \sqrt{u/4})$	$.25 \leq u \leq 4$, MCC 1 and 2 equipment $.10 \leq u \leq 2$ MCC 3 and 4 equipment $2 < u \leq 4$ MCC 3 and 4 equipment $u > 4$ 90% probability of no stock out in 90 days
TRIDENT	$u = POP \times RF$ MEC 116 Items $AQ = u/4 + (t\sqrt{u/4} + .5)$ MEC < 116 Items $AQ = u/4 + (t\sqrt{u/4})$	$t = \max \begin{cases} 1.3 \\ 7 - \log_{10}(\text{price}) \end{cases}$ $t = \max \begin{cases} 1.3 \\ 7 - ((116 - \text{MEC}) / 6) - \log_{10}(\text{price}) \end{cases}$
MCO	$u = POP \times RF$	

Figure 4. COSAL Computation Techniques

C. THE INCREMENTAL STOCK NUMBER SEQUENCE LIST (ISNSL)

1. ISNSL Development Background

The Incremental Stock Number Sequence List (ISNSL) is a computer application used to identify on-board repair parts (OBRP's) during the new construction of ships. The ISNSL is a Uniform Inventory Control Point (UICP) program developed by the Fleet Material Support Office (FMSO), Mechanicsburg, PA.

Shipbuilding contracts require the shipbuilder to furnish an initial range and depth of spare and repair parts for contractor supplied equipment. The Navy provides repair parts support for government furnished equipment. Prior to the development of the ISNSL method, shipbuilding contractors submitted Provisioning Technical Documentation (PTD) for equipment requiring repair parts support. From an inspection of the PTD it is determined if the equipment has been previously provisioned or if initial provisioning is required. If the equipment has been previously provisioned the existing Allowance Parts List (APL) is assigned, otherwise a new APL is developed during initial provisioning.

The APL identifies all maintenance significant parts and the range and depth of repair parts to be stocked onboard the ship. Many shipbuilders procure the items required for onboard stockage by individual equipment,

without consideration of the duplicity of identical parts between equipment. For example, shipbuilders would buy the repair parts required for the fresh water pumps separately from those needed for the condensate pumps. Although these pumps have different APL numbers and perform different functions, they frequently have common repair parts. Since total ship repair part allowances are computed by accumulating all installed equipment and considering repair parts collectively for stockage, this method resulted in either insufficient or excessive material being bought by the contractor. In general, both excesses of common material and the shortages of unique items resulted.

The repair part purchasing methods used by new construction ship contractors varies among shipyards and sometimes between ships within the same shipyard. Some shipbuilders buy spares and repair parts in multiple "ship set" quantities while other builders buy a single "ship set" at a time. Therefore, during a ship or ship class construction period the same equipment can be bought, installed and provisioned on several occasions. Even if comprehensive consolidated procurement methods were used by the shipbuilding contractor, there is no way for the equipment provisioner to identify repair part commonality across different equipment and components and forward that information to the shipbuilder. The equipment provisioner is an expert on the support requirements of individual

equipments, not the support requirements of an entire ship. It is the purpose of the ISNSL and COSAL processes to identify repair part commonality among different equipments installed on a single ship.

In the development of the ISNSL, there existed a methodology which permitted the consideration of multiple applications of identical equipment within a ship, and the commonality of repair parts across different equipment in the stockage determination process. The ISNSL also provided the shipbuilding contractor with the ability to buy repair parts in consolidated contracts rather than with a variety of individual repair part purchases amended to equipment procurements. [Ref. 16]

Prior to the ISNSL process the ability to distinguish between repair parts supporting Government Furnished Equipment (GFE) and those needed to support Contractor Furnished Equipment (CFE) was difficult. The repair parts required to support CFE are known as Contractor Furnished Materials (CFM) while those needed to support GFE are known as Government Furnished Materials (GFM). The use of the COSAL for this purpose was not viable because the COSAL does not distinguish between GFM and CFM. The COSAL only provides range and depth of spares and repair parts.

An additional problem with reliance on the COSAL as the only new construction ship allowance development and outfitting tool was that it provided a total ships

configuration and repair parts requirement only near the end of the ship's construction period. The time when the COSAL would be available would not provide adequate procurement lead time to buy required repair parts to meet the shipbuilding schedule. [Ref. 16]

2. The ISNSL Process

Recognizing the need to develop a uniform automated method of determining new construction ship repair part range and depth requirements, the Naval Sea Systems Command and the Naval Supply Systems Command assigned the Fleet Material Support Office to develop the Incremental Stock Number Sequence List (ISNSL).

During the ship construction period, configuration information is sent to the Weapons Systems File (WSF) to form an equipment/component configuration data base. The methods by which this configuration is submitted to the WSF and the level of detail varies and depends on each shipbuilding contract. By extracting the ship configuration data at selected times agreed upon within the shipbuilding contract, shipboard allowances can be computed for the equipment which is installed to date. This procedure allows the determination of spare and repair part requirements with consideration of commonality of material across the existing equipment population. The configuration reporting requirements identify the equipment as being contractor or government furnished and thereby identify the required

spares as being contractor or government furnished. Subsequent ISNSL computations are compared with previous ISNSL requirements to determine appropriate stockage adjustments.

The primary objectives of the ISNSL process are:

- a. To distinguish between contractor and government furnished material.
- b. Identify spare and repair part requirements at pre-determined intervals during the ship construction process.
- c. Identify commonalty of parts between equipment
- d. Provide methods and aids to the shipbuilding contractor for consolidating buys of like parts.
- e. Compute repair part allowances under the authorized model. (The ISNSL process can be used with any COSAL computation.)
- f. Provide a method of identifying required allowance material sufficiently in advance of required delivery dates to allow for timely procurement.

The ISNSL computer programs are run at the Ships Parts Control Center, Mechanicsburg, PA. They are typically run monthly depending on allowance document scheduling and workload requirements. ISNSL programs closely interact with the COSAL process in determining new construction repair part requirements. In a sense, the ISNSL program can be

viewed as calling the COSAL process during execution.
[Refs. 5,16]

Individual ship configuration information is the basis for the computation of ISNSL products. Configuration information is reported to the Inventory Control Point by the construction shipyard or other designated activity. This information is used to update the configuration portion of the ship's Weapon System File (WSF).

This configuration update is typically done on a monthly basis. Under many shipbuilding contracts the Fitting Out Management Information Systems (FOMIS) is used to provide configuration status accounting information. The configuration data contained in FOMIS is used to load the applicable data elements within the WSF level A, while equipment provisioning efforts load repair part information for each equipment within the WSF level C, and also into the MDF and PSI.

The COSAL programs are used to extract configuration and repair part information from the WSF and other supporting UICP files. The extracted data is then processed through the appropriate mathematical model to provide ISNSL allowances. Follow-on ISNSL/COSAL computations use information from the previous run to determine the net repair part stockage increases, decreases and deletions. The final ISNSL is produced concurrently with the ship's

Load COSAL. Figure 5 summaries the organization, interfaces and data flow of the ISNSL program.

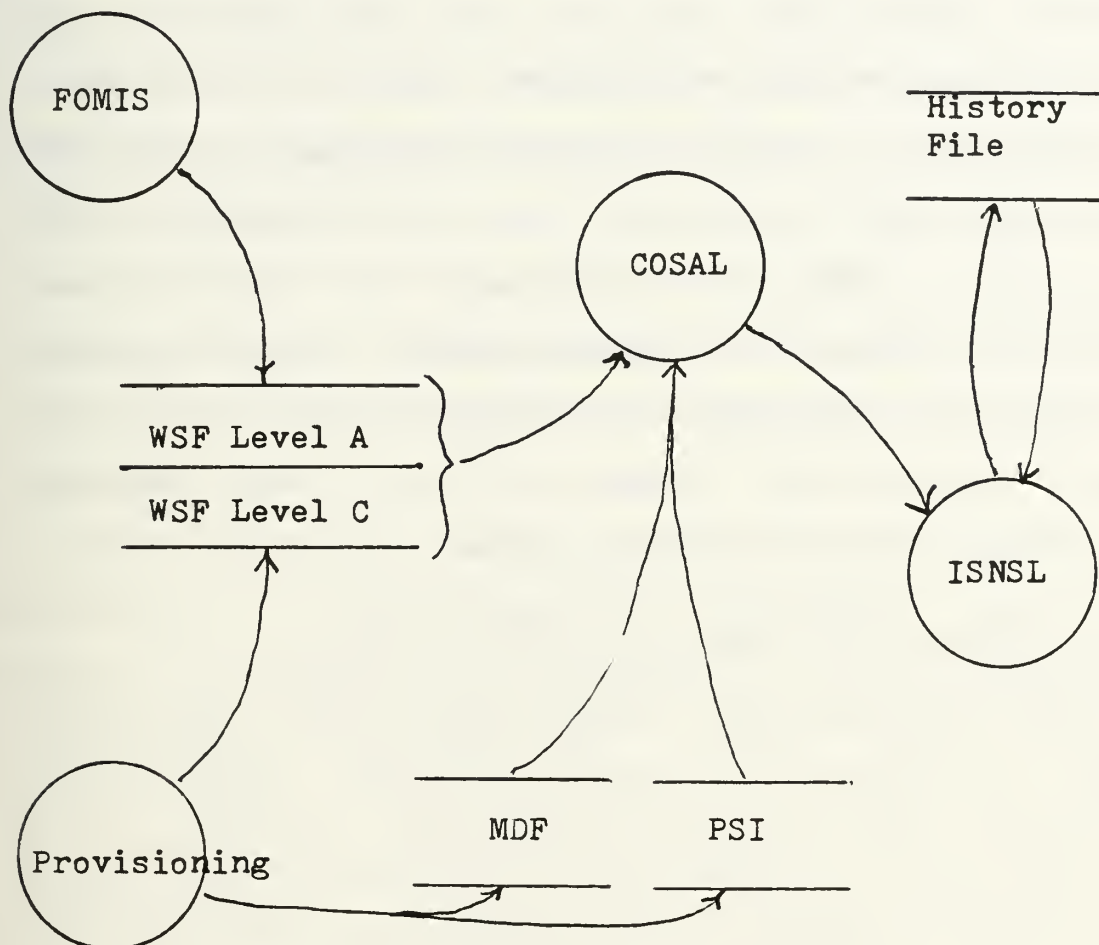


Figure 5. ISNSL Program Interfaces

The ISNSL process permits the identification and procurement of spare repair part allowances considering lead time. Through a method of identifying common equipment and components and summing their support requirements prior to

allowance computation a first step is taken in reducing the excess materials accumulated throughout a shipbuilding program. This first step was significant, but in light of increased shipbuilding activity and the complexity and expense of new shipboard equipment, this first step is no longer sufficient. Recent shipbuilding programs have been accumulating excess spare and repair part allowances at an alarming rate [Ref. 1]. Although the ISNSL process provides a method for consolidating ship allowance requirements it does not address the problems of excess material accumulation caused by an ever changing configuration and piece part data base.

D. NEW CONSTRUCTION CONFIGURATION DEVELOPMENT

Broadly, configuration status accounting is the booking process of recording a ship's equipment installations, modifications and deletions from the WSF. The profile of a ship's installed equipment is known as a configuration index. The configuration index of each Navy ship is contained in Level A of the Weapons Systems File (WSF). The basis of shipboard supply support rests with the accuracy and validity of it's configuration index within the WSF. The establishment of a ship's configuration index is the responsibility of the HSC and is often delegated to the shipbuilding contractor or Naval Supervisory Activity (NSA). The Fitting Out Management Information System (FOMIS) and

Preliminary Equipment Configuration Index (PECI) are two methods commonly used by the HSC to develop the configuration index within the WSF for new construction ships.

FOMIS is a computer based integrated management system developed by the Naval Sea Systems Command. The purpose of FOMIS is to provide:

- 1) A configuration status accounting system
- 2) A management oriented logistics information system
- 3) A centralized data base for Integrated Logistic Support (ILS) data.

The FOMIS program is run by SPCC and loads data into the WSF Level A. The configuration information reported by FOMIS is developed and submitted by an HSC designated activity for each shipbuilding program. FOMIS provides a method to define a ship's configuration and monitor progress towards index completion. FOMIS monitors the status of contractor and government furnished equipment installation and configuration reporting.

FOMIS records are established for each installed equipment and contain specific provisioning, procurement, maintenance, installation and validation information. Each FOMIS record is updated incrementally as progress is made towards completion of installation and provisioning activities. When an equipment's FOMIS record contains the necessary data elements to establish a WSF Level A record,

the WSF is updated to reflect the installation of that equipment on a specific ship. In short, FOMIS contains a broad base of logistic and supply support information developed incrementally throughout the ship's construction period and used to establish the ship's WSF Level A configuration index. The Fitting Out Management Information System (FOMIS) is currently used in FFG-7, SSBN-726 and CG-47 shipbuilding programs. [Ref. 17]

The Preliminary Equipment Component Index (PECI) system is a file containing prescribed technical data on equipments and components applicable to a specific ship. SPCC develops and maintains the PECI file based on information supplied by the HSC, Naval Supervisory Activity and shipbuilder. PECI was originally developed as a manual configuration reporting system unlike the mechanized FOMIS process. The PECI input of equipment adds, deletes and changes is based on the NAVSUP Form 1174. PECI has evolved into a partially automated system in that images of Form 1174 records are transmitted to SPCC on magnetic tape for loading to the WSF Level A. The PECI configuration reporting system is currently used on SSN-688 and CVN/CV SLEP (Ship's Life Extension Program) programs.

Regardless of the configuration reporting method used during ship construction, the key aspect of configuration development is accuracy. Accurate reporting of installed equipment is critical to allowance development.

The validation of a ship's installed equipments and accurate configuration reporting to the WSF are critical to the overall allowance development effort. Inaccurate configuration reported to the WSF during the allowance development period often results in buying too much or too little of needed repair parts.

Equipment validation is the process of assuring that the ship's installed equipment corresponds to the information provided to the WSF. Sight validation is the physical identification of equipment by a knowledgeable technician who verifies the equipment installation by comparing configuration records with actual equipment label plate data. Sample validation involves the review of technical drawings and blueprints to determine installed equipment characteristics.

Clearly, the accuracy of a ship's configuration index is crucial to the allowance development process. Inaccurate configuration information which is included in early ISNSL allowance computations and subsequently deleted in later ISNSL allowances, result in unneeded repair part purchases and excess material. Inaccurate configuration reporting is thought to be a factor contributing to the accumulation of excess allowance materials. [Ref. 1]

E. THE BEST REPLACEMENT FACTOR (BRF)

The Best Replacement Factor is a numeric representation of the expected annual number of replacements per part or component installed. The BRF has its origin in engineering reliability theory. Initial BRF assignment and periodic BRF adjustments are designed to reflect the life cycle of equipment. The life cycle consists of; an infant mortality period, a constant failure rate period and a wear out period (see Figure 6).

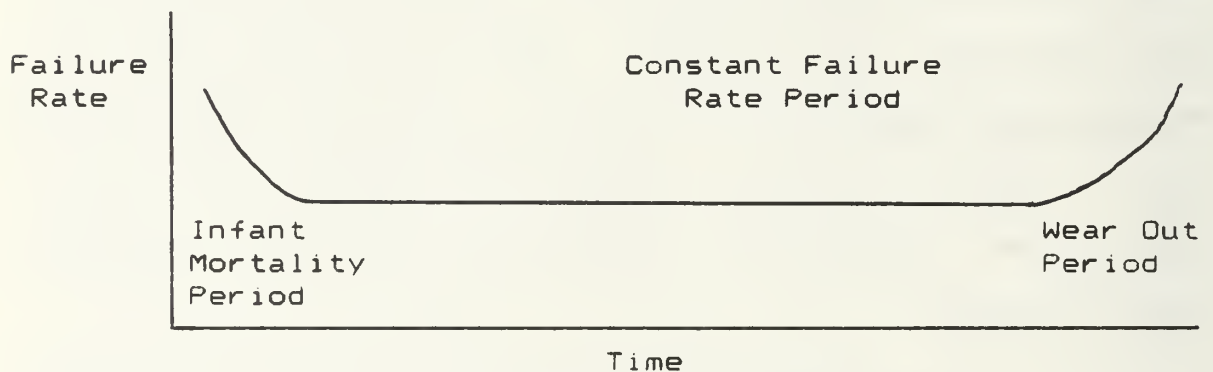


Figure 6. Bathtub Shape of the Reliability Curve

The BRF estimates item replacement rather than item failure because repair parts are often replaced prior to failure. Examples of replacement prior to failure include preventative maintenance, such as filters changes or the replacement of gaskets during an equipment overhaul. An understanding of the BRF is important because of its vital role in the computation of a repair part for allowance. [Ref. 18]

The replacement factor assigned to a new item of supply represents an engineering estimate. It is based on technical judgment and experience with similar items at the time of initial provisioning. The initial assignment of a replacement factor is known as a Technical Replacement Factor (TRF). As data is collected through the Navy's maintenance and parts use reporting systems and a demand pattern is established, the TRF is adjusted appropriately and becomes a BRF. The demand development period, or TRF to BRF transition period, is typically one to two years. After this period the TRF is combined with actual use data using a weighted average technique to arrive at the BRF.

The initial estimate of the replacement factor is very influential and has lasting consequences on the supply support of new equipment. An initial TRF which is too low will result in inadequate spare parts inventories both ashore and afloat. TRFs which are too high result in stocking too much.

TRFs are only assigned to new items of supply (no NSN assigned). If an item has been catalogued through previous provisioning, the item assumes the existing BRF value without regard to application. An important point to note is that an item has a single BRF, which applies to that item regardless of application. For example, if identical "O-rings" are installed on two different equipments, the BRF

for those O-rings are the same without regard to their application.

The Best Replacement Factor (BRF) is updated annually to include recent use and failure rate information in future supply decisions. The sources of information used for BRF updating are:

- 1) The Navy 3M (Maintenance Material Management) database
- 2) The Mobile Logistic Support Force (MLSF) database
- 3) The SPCC Transaction History File.

The method of updating the BRF has been under extensive study by the Fleet Material Support Office (FMSO), Mechanicsburg, PA. [Ref. 18]

Currently a weighted average method is used to annually recompute the BRF for each repair part. This method combines old BRF values with data from the current year. The smoothing weight places more emphasis on historical BRF data (about 60%) and less emphasis on an item's current behavior (about 40%). This weighting is based on the logic that an item's use over time is a more accurate portrait of its failure rate than a single year's data.

Alternative methods to update the BRF have been proposed. The alternatives include an adaptive smoothing technique based on the variation of average annual usage and a ratio computation method which computes BRF using total lifetime demand and average annual population.

The annual BRF update has been accused of causing a large portion of the ISNSL churn and resulting outfitting material excesses. The current weighted average BRF updating method allows a single year's usage to dramatically affect new BRF values. The recommended alternative BRF updating are designed to attenuate the affect of a single year's usage data on BRF value.

The BRF is a key factor in the allowance development process. It's value will determine whether an item will be stocked aboard ship or remain stocked only in the wholesale supply system. Because of the BRF's vital role, it's annual adjustment affects the time phased allowance development procedures used by SCN shipbuilding programs.

A ship will receive several ISNSL computations over a three or four year period. Some of these ISNSL computations will bracket an annual BRF update. An ISNSL stockage computed before and then after an annual BRF adjustment will result in different spare and repair part allowances.

F. SUMMARY

Chapter II provided a broad perspective of the environment, procedures, activities and factors involved in the SCN allowance development process. These activities include logistic and maintenance planning, provisioning, configuration development and ISNSL/COSAL stockage computation. The factors considered by each specific

allowance computation model are an output of the provisioning and configuration development process. These factors include equipment and parts population sizes, maintenance code decisions, equipment criticality decisions, and BRF. Any changes in these factors can result in changes in allowance quantities (either additions or deletions) and in the accumulation of excess outfitting material.

Perhaps the most influential factors involved in allowance adjustments and ISNSL churn are configuration changes and BRF updating. The following chapters attempt to isolate and quantify the affects these factors have on ISNSL churn.

III. INVESTIGATIVE FRAMEWORK

A. BACKGROUND

Chapter II introduced the environment and processes of the SCN initial computation of repair parts stockage aboard ship. Many logistic and engineering decisions made early in the shipbuilding process have a significant impact on initial allowance computation and supply support. The Logistic Support Analysis (LSA) and maintenance concept are examples of these decisions.

Before the first equipment is provisioned by the ICP or the first configuration record is entered in the WSF these "front end" decisions have established a foundation upon which initial shipboard allowances are determined. Once made, these decisions generally remain constant throughout the initial allowance development period. Because of this static nature these "front end" decisions have little impact on the ISNSL churn and allowance excess issue. On an individual equipment basis, major changes in maintenance philosophy during the allowance development period will result in adjusted repair part support and ISNSL churn. Fortunately, these changes are made infrequently.

A further understanding of ISNSL churn and it's relationship to excess outfitting material is needed at this point. ISNSL churn and excess outfitting materials are not

interchangeable terms. The term ISNSL churn refers to the change in allowed shipboard stockage levels. These changes occur during the period of time over which the ship is being built. ISNSL churn includes inventory range adjustments and depth adjustments.

Excess outfitting materials refer to those items ordered and received based upon an ISNSL computed early in the shipbuilding process which are not part of the final ship's ISNSL and Load COSAL stockage allowance. Clearly excess outfitting material is more closely associated to ISNSL range deletes and depth decreases than ISNSL additions. If every allowance item on every ISNSL was ordered and received prior to the computation of subsequent ISNSL, then the ISNSL deletes would closely resemble the outfitting excesses. However, this condition is not the case. ISNSL re-computations are typically spaced six to nine months apart and the requisition processing time, procurement lead time and outfitting requirements policies often preclude filling every outfitting requisition before the next ISNSL is produced. This results in the canceling of outstanding outfitting requisitions prior to receipt of material. In short, excess outfitting materials are a subset of the ISNSL deletions experienced by a ship during its allowance development and outfitting.

Just as ISNSL deletes do not always result in outfitting material excesses, not all excesses result from the ISNSL

process. For example, new weapon systems are often supported by the equipment manufacturer or other contractor early in the equipment's life cycle. This allows the Navy adequate time to plan the provisioning of the equipment and procure needed spares and repair parts for wholesale and retail support. During this period of contractor support, initial onboard allowances are computed for the ship by the HSC or equipment vendor. Repair parts stocked under these circumstances are known as Type III spares.

As contractor supported equipment is provisioned and the WSF database is loaded, the corresponding ISNSL allowance computations must be ignored by the outfitting activity. If this process breaks down, ISNSL allowance items are ordered and received in excess of the Type III items authorized for allowance. While this type of excess must be prevented it is not a direct result of the ISNSL process and ISNSL churn.

Of the factors affecting an item's allowance computation, the Best Replacement Factor (BRF) and WSF configuration changes are thought to be the two primary causes of ISNSL churn [Ref. 2]. The following analyses were done in an attempt to isolate these factors and determine their impact on ISNSL churn:

- 1) A Statistical analysis of SSBN-726 Trident Submarine ISNSL products
- 2) A statistical analysis of Third and Fourth Flight FFG-7 Class Guided Missile Frigate ISNSL products.

The tools of statistical analysis used include multiple linear regression, variance analysis and mean comparisons. The regression analysis attempts to describe the relationships between ISNSL churn, configuration changes and BRF adjustments. Variance analysis and mean comparisons attempt to identify differences in ISNSL churn between the categories of ISNSL and COSAL allowance material. Further, an effort is made to isolate the affects of annual BRF updating on ISNSL churn.

The FFG-7 and and SSBN-726 shipbuilding programs were selected for analysis for the following reasons:

- 1) Both ship classes had complete ISNSL statistics available for 24 ships.
- 2) The FFG-7 and SSBN-726 programs use similar COSAL computation models.
- 3) Both FFG-7 and SSBN-726 programs use FOMIS for WSF configuration reporting.
- 4) The FFG-7 shipbuilding program is executed at three shipyards and supervised by three NSAs. The FFG-7 FOMIS reporting responsibilities spread among all NSAs and the Ship Project Manager. The SSBN-726 submarines are built at a single shipyard with a single activity responsible for FOMIS configuration development. The difference between these two programs permit comparisons between centralized and distributed configuration

reporting responsibilities and the effect of configuration reporting on ISNSL churn.

B. METHODOLOGY

ISNSL statistics on FFG-40 through FFG-58 and SSBN-727,729,730,731 and 733 were collected from the Ships Parts Control Center (SPCC), Mechanicsburg, PA. These ISNSL statistics include summary information on configuration, authorized allowance, allowance additions, and allowance deletions from one ISNSL to the next. This data is broken down by equipment supplier ; Government Furnished (GF) or Contractor Furnished (CF)) and storage location; Storeroom (SRI) or Operating Space (OSI).

The annual BRF update at SPCC generally occurs in the June/July time frame. By identifying those ISNSL allowances affected by an annual BRF update and comparing them with ISNSL computations not affected by annual BRF updating the impact of BRF updates on ISNSL churn may be partially isolated. This comparison is made through a series of statistical tests applied to the ISNSL data within each group (Third Flight FFGs, Fourth Flight FFGs, and SSBN-726) to determine if churn differs between those ISNSL allowances affected by an annual BRF update and those which were not. Additionally, comparisons are made between groups to determine if BRF update behaves similarly regardless of ship class.

Using ISNSL statistics to isolate the impact of configuration changes on ISNSL churn is less conclusive. ISNSL configuration statistics identify only net adjustments to a ship's Weapon Systems File (WSF) configuration and do not provide information on specific equipments added or deleted. For example, the ISNSL configuration summary report may indicate a total range adjustment of 100 added configuration records (APLS/AELs) and a total depth adjustment of 250 additional configuration records. This information provides few clues about how many repair parts are involved in the configuration changes reported since the last ISNSL was computed.

Not all configuration records affect supply support and onboard allowances equally. Some equipments have few repair parts on their APLs while others have many. Therefore the impact of configuration changes on ISNSL allowances greatly depends on what equipment is involved with the configuration changes. It is important to recognize this shortcoming in the analysis of configuration changes and their impact on ISNSL churn. Additionally, the WSF is a steadily growing database during construction. Configuration deletions are few compared to the total number of transactions.

In addition to the above, a review of ISNSL range and depth deletions is conducted. The purpose of this review is to characterize the nature of ISNSL deletions and draw some

conclusions about their effect on afloat support and ISNSL churn.

The ISNSL data from SPCC has separated into three groups:

- 1) Third Flight FFG-7 class ships (FFG-40 through FFG-49)
- 2) Fourth Flight FFG-7 class ships (FFG-50 through FFG-58)
- 3) SSBN-726 class submarines.

The FFG-7 class ships are separated by flight because of differences in their configuration during the outfitting period.

Within each group the ISNSL configuration and allowance data is stratified by supplier (Government or Contractor), storage location (Storeroom or Operating Space) and occurrence of an annual BRF update. This was done to isolate the affects of configuration changes and annual BRF updating on allowance additions and deletions (ISNSL churn).

The number of ISNSLs computed per ship during initial allowance development varies between groups and from ship to ship within groups. Third Flight FFG-7s received 4 ISNSLs during the allowance development period while Fourth Flight FFG-7s received 3. The reduction from four to three ISNSLs on FFG-7s was made for three reasons; 1) the Fourth Flight FFG-7 construction and delivery was accelerated three to six months, reducing the time frame from first ISNSL to final ISNSL computation and Load COSAL, 2) the Fourth Flight FFG-7's configuration baseline was believed to be more stable

and 3) most major FFG-7 class weapon systems had completed the provisioning process.

The SSBN-726 class submarines have received a variable number of ISNSLs during allowance development. Submarines built early in the program received as many as ten ISNSL computations while those currently under construction received only two. The reduction in ISNSL computations reflects the stabilized configuration of the ship class and the completion of most major weapon system provisioning. The SSBN-726 class configuration is thought to be greater than 98 percent identical between each submarine. This similarity between hulls is due to the following; 1) a single shipbuilder constructing all SSBN-726 submarines and 2) high standardization requirements placed on strategic weapon systems by the Navy's Strategic Systems Project Office (SSPO).

In contrast to the equipment standardization on SSBN-726 submarines the configuration of FFG-7 class ships is believed to be 70 to 80 percent identical [Ref. 18]. The FFG-7 class has been constructed at three shipyards. Although the FFG-7 class represents a substantial improvement in equipment standardization among surface ship programs, it has a much greater equipment variety than the SSBN-726 class.

Throughout the analysis, each ship's first ISNSL data has been omitted. This is because the first ISNSL

computation reflects the initial stockage allowance and therefore no ISNSL churn has occurred.

Within each data group a three-fold approach will be taken to determine the causes of ISNSL churn. First, the relationship between configuration changes, annual BRF updating and ISNSL churn is examined. Correlation and regression analysis tools are used for this purpose.

Secondly, ISNSL allowance additions are examined. Allowance additions are analyzed in general and then decomposed by supplier, storage location and occurrence of an annual BRF update. Mean comparisons and analysis of variance are used for this analysis. Finally, ISNSL allowance deletions are studied in a manner similar to ISNSL allowance additions.

The theoretical foundations of the statistical analysis is based on an assumption of random sampling from an infinite population. This theoretical approach is not without limitations. The use of finite population adjustments or non-parametric procedures on statistical testing of ISNSL data can be argued as appropriate. However, because the SSBN-726 and FFG-7 data represents a near census of the population, the use of finite population correction factors will not significantly alter the results. Additionally, concern over occasional outlier data points supports the use of non-parametric procedures. It is beyond the scope of this research to analyze ISNSL data under all

three statistical assumptions (finite population, infinite population and non-normally distributed population).

Random, uniformly distributed and infinite population statistical assumptions have been used because of their conservative results. The use of finite population adjustments may lead to overly strong conclusions regarding the affects of configuration changes and BRF updating on ISNSL churn. Non-parametric tests (Mann-Whitney and Wilcoxon procedures) were performed on ISNSL data. The results of the non-parametric tests do not differ significantly from those tests using parametric statistical techniques. Therefore, non-parametric test results have not been included.

The specific computations used in the ISNSL data analysis are described below.

1. Correlation and Regression Analysis

These computations attempt to study and measure the statistical relationships between configuration, annual BRF updating and ISNSL churn. Correlation analysis measures the degree of statistical closeness between variables. Of interest in this case is how closely configuration changes and annual BRF updating are related to ISNSL churn. Regression analysis develops an estimate of the specific mathematical form of the relationships between the variables. Regression analysis describes the pattern of variable relationships. [Refs. 19,20]

2. Comparisons of Means, Confidence Intervals and Analysis of Variance

These computations attempt to determine if ISNSL churn is affected by BRF updating and if various categories of allowance material behave differently with regard to BRF updating. Mean comparisons determine if there is a statistical difference between mean values of different populations. In this case the mean or average percentage of ISNSL additions and deletions will be compared.

Confidence interval tests provide a range of mean population values based on sample means and the variation within the samples.

Analysis of variance testing attempts to determine if the variation between population samples is significant given the variation within each sample. For example, given the difference in variation between FFG-7 and SSBN-726 ISNSL churn, is this difference significant considering the variation within FFG-7 and SSBN-726 ISNSL churn? [Ref. 20]

C. SUMMARY

The methodology used to conduct research for this thesis has been outlined in the preceding chapter. Through a statistical comparison of ISNSL records from FFG-7 and SSBN-726 class shipbuilding programs it is hoped that the effects of configuration changes and BRF updating on ISNSL churn become more evident. Through understanding the causes of

ISNSL churn, corrective actions can be recommended to reduce it. Reduction in ISNSL churn may in turn reduce the amount of excess outfitting material accumulated during the SCN allowance development process.

VI. ANALYSIS AND DISCUSSION OF DATA

A. DATA ORGANIZATION AND PRESENTATION

Chapter II introduced the SCN initial allowance development process, and described its implementation and supporting programs. The purpose was to provide the background from which ISNSL churn and the accumulation of excess initial outfitting material can be understood and evaluated. Chapter III outlined an approach to the study of ISNSL churn involving the analysis of FFG-7 and SSBN-726 ISNSL products. The purpose of this chapter is to present the results of this statistical analysis.

The data used in this analysis was obtained from SSBN-726 and FFG-7 class ISNSL products. Data tables, descriptive plots and test results are contained in Appendices A through P.

B. SSBN-726 ISNSL DATA ANALYSIS

This section contains an analysis of SSBN-726 ISNSL data. Data from the lead ship in the class has been omitted because of the unusually high number of ISNSLs needed to complete allowance development and outfitting. The lead ship of a shipbuilding program typically experiences more configuration and allowance volatility because of the requirement to newly provision most major equipments.

The data analysis will be presented in the following order;

- 1) Correlation and regression analysis
- 2) Mean comparisons and analysis of variance
- 3) Discussion.

An additional qualification regarding the ISNSL data used in the following analysis is necessary. Unless otherwise stated, ISNSL allowance additions and deletions reflect item range only. ISNSL depth churn will be discussed separately.

1. Correlation and Regression Analysis

Appendix A contains the SSBN-726 ISNSL correlation and regression analysis. Table 1 summarizes the ISNSL data used for this analysis. Configuration range data represents the net number of configuration range changes (number of different configuration records changes) from the previous ISNSL. Configuration depth changes represent the total number of configuration records changed from the previous ISNSL. Adds and deletes represent allowance range additions and deletions (all suppliers and storage locations) from the previous ISNSL. Total churn is a summation of range adds and deletes. BRF update is a binary variable indicating the occurrence of an annual BRF update since the previous ISNSL computation (a 1 indicates a BRF update occurred, a 0 means a BRF update did not occur).

TABLE 1
SSBN-726 REGRESSION AND CORRELATION DATA

Independent Variables					Dependent Variables		
Hull	ISNSL	Config Range	Config Depth	BRF Update	Adds	Deletes	Total Churn
727	2	53	264	1	3104	2655	5759
727	3	84	380	0	1006	2458	3464
727	4	32	392	0	1298	618	1916
727	5	0	113	1	1971	2551	4522
727	6	14	282	0	2325	1205	3530
729	2	52	224	1	2454	2194	4648
729	3	370	433	0	2382	1065	3447
730	2	223	2867	0	3025	2022	5047
730	3	386	381	1	4542	1984	6526
731	2	9	330	0	1272	1015	2287
731	3	68	135	1	2062	2144	4206
733	2	300	993	1	7768	6945	14713

Table 2 displays the results of correlation computations between all data variables in table 1. A review of the correlation results suggests the relationship between configuration changes and ISNSL range adds and deletes is weaker than the relationship between the occurrence of an annual BRF update and ISNSL range adds and deletes. Based on this information alone, ISNSL churn appears to be more closely associated with BRF updating than configuration changes on SSBN-726 submarines. However, there is no strong correlation between any single causative factor and ISNSL churn.

TABLE 2
SSBN-726 CORRELATION TABLE

	Config Range	Config Depth	Adds	Deletes	Adds+ Deletes
Config Depth	0.354				
Adds	0.623	0.272			
Deletes	0.302	0.171	0.840		
Adds+Deletes	0.492	0.234	0.964	0.954	
BRF Update	0.076	-0.295	0.500	0.539	0.540

A simple regression equation using either configuration changes or BRF updating as the single independent variable does not result in a useful equation to describe ISNSL churn on SSBN-726 hulls. The correlation data of Table 2 supports the notion that no single variable has a strong relationship with ISNSL churn.

It is important to note that ISNSL churn involves two components, namely allowance additions and deletions. Although ISNSL deletions are of primary concern because of their relationship to excess outfitting material it is useful to determine if configuration and BRF changes affect ISNSL additions and deletions differently. Given that the ISNSL deletion and additions are generated from the same configuration data and are affected equally by BRF updates, it is important to know if the mean number of ISNSL range deletions and range additions are significantly different.

Table 3 displays the results of the t-test and analysis of variance computations on the number of range additions and deletions per SSBN ISNSL. These tests suggest

no difference between the mean number of adds and deletes. We can conclude that BRF and configuration changes probably affect them equally.

TABLE 3
SSBN ISNSL ALLOWANCE ADDITIONS VS ALLOWANCE DELETIONS
T TEST AND ANALYSIS OF VARIANCE

ISNSL Adds vs ISNSL Deletes T Test

	N	MEAN	STDEV	SE MEAN
ISNSL Adds	12	2767	1844	532
ISNSL Deletes	12	2238	1628	470

95 PCT CI FOR MU ISNSL Adds - MU ISNSL Deletes: (-948, 2007)
TTEST MU ISNSL Adds = MU ISNSL Deletes (VS NE): T=0.75
P=0.46 DF=21.7

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	1681691	1681691	0.56
ERROR	22	66568176	3025826	
TOTAL	23	68249856		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
ISNSL Adds	12	2767	1844	(-----*-----)
ISNSL Deletes	12	2238	1628	(-----*-----)
POOLED STDEV =				1739 1500 2250 3000 3750

Multiple linear regression analysis was performed on the SSBN ISNSL data with more useful results than simple regression. ISNSL additions and deletions were used as the dependent variables. Configuration range, depth and the binary annual BRF update indicator were used as the independent variables.

The regression equation for ISNSL additions is:

$$\text{ISNSL Adds} = 638 + 6.21(\text{Config Range}) + 0.626(\text{Config Depth}) + 1902(\text{BRF Update Indicator})$$

$$s = 1289 \quad R\text{-sq} = 64.5\%$$

The regression equation for ISNSL deletions is:

$$\text{ISNSL Deletes} = 690 + 1.66(\text{Config Range}) + 0.646(\text{Config Depth}) + 1924 (\text{BRF Update Indicator})$$

$$s = 1443 \quad R\text{-sq} = 42.9\%$$

The standard error of the estimate ("s") measures the dispersion of data around the regression line. The standard error of the estimate is also known as the residual standard deviation. The standard error of the estimate is used to determine confidence intervals about the regression line. [Ref 20]

The coefficient of determination (R-sq) provides a percentage of the total variation in the dependent variable (ISNSL adds or deletes) which is explained by the differences in the independent variables [Ref. 20].

Because it appears ISNSL additions and deletions react similarly to configuration and BRF changes, it follows that they have similar regression equations.

2. Mean Comparison and Analysis of Variance

The following section attempts to answer questions about the impact of annual BRF updating on ISNSL churn. The analysis involves a series of statistical hypothesis testing procedures. The first step in the analysis is to group the SSBN ISNSL data to isolate the effects of annual BRF

updating on ISNSL additions and deletions. The second step is to compare the mean percentage of ISNSL churn between groups via hypothesis testing to determine any statistical differences. The percentage of ISNSL churn is defined as the range of ISNSL additions or deletions divided by the total range of ISNSL allowance items. For example, if an ISNSL had 1000 contractor furnished (CF) storeroom items (SRI) deletions and a total of 4000 contractor furnished storeroom items authorized, then ISNSL deletion churn would equal 25 percent for CF SRI stockage allowances.

In hypothesis testing of the equality or inequality of two sample means or percentages there are two possible conditions, the hypothesis is either true or false. The statistical significance desired determines the acceptance or rejection regions of the hypothesis. On any given hypothesis test an error may be committed in one of two ways.

The first kind of error, known as a Type I error, rejects the hypothesis as false when in fact it is true. For example, we reject the hypothesis that SSBN-726 ISNSL allowance additions affected by BRF updating are equal to those not affected by BRF updating when in fact it is true.

The second type of error, known as a Type II error, accepts the hypothesis as true when in fact it is false. The level of significant and sample size determines the probability of committing Type I and Type II errors. A 5

percent level of significance was used in all hypothesis tests (probability of rejecting the hypothesis erroneously is five percent). In all of the following hypothesis tests, SSBN-726 ISNSL data are used to estimate the mean and variation of the actual SSBN-726 ISNSL population. Because of this assumption, the t-test and t distribution is used. [Refs. 19,208,21]

ISNSL allowances are divided in several categories based on the supplier of the parent equipment and the purpose and storage location of the material. Allowance items are designated as Contractor Furnished (CF)) if the shipbuilder supplied the parent equipment, and Government Furnished (GF) if the Navy or other government agency provided the equipment. In most SCN programs, mechanical and electrical equipment is contractor furnished while electronic and ordnance equipment is government furnished.

Within CF and GF supplier categories repair parts are further divided into storeroom items (SRI) and operating space items (OSI). Storeroom items are those spares and repair parts in the custody of the ship's Supply Department. They are stocked to meet forecasted recurring demand.

Operating space items are spares and repair parts stored in the same space as the installed equipment. Operating space items include Ready Service Spares (RSS), battle spares, and Maintenance Assist Modules (MAMS). Battle spares and RSS are supply department items stored in

the same space as the parent equipment to permit quick repair of equipment during battle conditions. MAMS are also stored in the same space as the parent equipment. However, MAMS are a part of the equipment's maintenance concept, function similarly to test equipment and are used primarily for fault isolation. Operating space items compute for allowance based on override or allowance note codes that bypass the full ISNSL/COSAL computation model. If operating space items bypass much of the ISNSL/COSAL computation process, it follows that changes to key allowance determinants (e.g., BRF) would affect OSI allowance computation less. With the above in mind an analysis of SSBN-726 ISNSL data follows.

a. SSBN-726 ISNSL Allowance Additions

Appendices B and C contain data and test results on SSBN-726 class ISNSL allowance additions. Appendix B looks at SSBN-726 ISNSL additions overall and attempts to answer the following questions:

- 1) Is there a difference between government furnished and contractor furnished ISNSL allowance additions without regard to BRF updating?
- 2) Is there a difference between SRI and OSI material ISNSL allowance additions without regard to BRF updating?

Appendix C decomposes the data into those ISNSLs affected by an annual BRF update and those not affected by BRF updating. Appendix C attempts to answer the following:

- 1) Is there a difference between the allowance additions on ISNSL's affected by an annual BRF update and those not affected by annual BRF updating?
- 2) Does annual BRF updating affect contractor furnished, government furnished, SRI and OSI allowance items differently?

Tables 4 and 5 display a summary of SSBN-726 class government and contractor furnished ISNSL allowance additions separated by storage location. These tables include the number of allowance items within each category (SRI or OSI) and the number of allowance additions resulting from the corresponding ISNSL. Figure 7 plots the percentage of ISNLS allowance additions displayed in Table 4.

TABLE 4
SSBN-726 GF SRI AND GF OSI ISNSL ALLOWANCE ADDITIONS

Hull	ISNSL	GF/SRI Allw	GF/SRI Adds	GF/SRI Adds %	GF/OSI Allw	GF/OSI Adds	GF/OSI Adds %
727	2	4535	1428	31.4884	2204	494	22.4138
727	3	3332	411	12.3349	2193	51	2.3256
727	4	3480	359	10.3161	2163	172	7.9519
727	5	3527	653	18.5143	2275	339	14.9011
727	6	3885	1011	26.0231	2580	442	17.1318
729	2	4265	955	22.3916	3113	435	13.9737
729	3	4310	445	10.3248	3074	177	5.7580
730	2	3733	1318	35.3067	2650	1233	46.5283
730	3	4339	1309	30.1682	3246	1088	33.5182
731	2	4054	173	4.2674	3182	173	5.4368
731	3	4299	532	12.3750	2653	251	9.4610
733	2	4258	3499	82.1747	3209	2184	68.0586

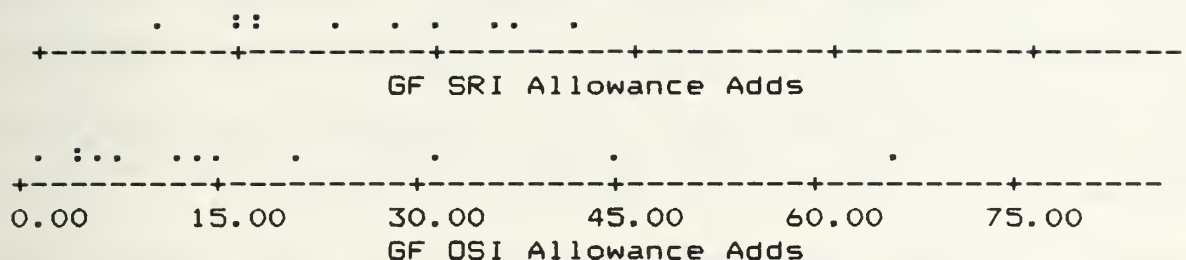


Figure 7. SSBN-726 GF SRI vs GF OSI ISNSL Allowance Additions Dotplot

TABLE 5
SSBN-726 CF SRI AND CF OSI ISNSL ALLOWANCE ADDITIONS

Hull	ISNSL	CF/SRI Allw	CF/SRI Addds	CF/SRI Addds %	CF/OSI Allw	CF/OSI Addds	CF/OSI Addds %
727	2	6893	1088	15.7841	489	94	19.2229
727	3	7040	523	7.4290	456	21	4.6053
727	4	7200	761	10.5694	377	6	1.5915
727	5	6944	886	12.7592	400	93	22.2500
727	6	7117	755	10.6084	500	117	23.4000
729	2	6353	900	14.1665	633	164	25.9084
729	3	7225	1392	19.2664	935	368	39.3583
730	2	6385	454	7.1104	683	174	25.4758
730	3	7207	1778	24.6705	938	366	39.0192
731	2	7119	693	9.7345	927	233	25.1348
731	3	7193	977	13.5826	935	302	32.2995
733	2	6996	1953	27.9159	1004	162	16.1355

TABLE 6
SSBN-726 GF SRI VS GF OSI ISNSL ALLOWANCE ADDITIONS T TEST
AND ANALYSIS OF VARIANCE

T Test for GF SRI Adds vs CF SRI Adds

	N	MEAN	STDEV	SE MEAN
GF SRI	12	24.6	20.6	5.9
GF OSI	12	20.6	19.7	5.7

95 PCT CI FOR MU GF SRI Adds - MU GF OSI Adds: (-13.1, 21.1)
TTEST MU GF SRI Adds = MU GF OSI Adds (VS NE): T=0.49 P=0.63
DF=22.0

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	97	97	0.24
ERROR	22	8924	406	
TOTAL	23	9021		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI	12	24.64	20.61	(-----*-----)
GF OSI	12	20.62	19.66	(-----*-----)
POOLED STDEV = 20.14				16.0 24.0 32.0

Comparing the mean percentage of ISNSL allowance additions between supplier and storage location suggests whether the ISNSL computation process affects these material categories differently. Table 6 displays the results of t-test and analysis of variance comparisons between SSBN-726 GF SRI and GF OSI allowance additions.

The bottom line of the statistical analysis of Appendix B is that there appears to be no difference in the percentage of ISNSL allowance additions experience between GF and CF materials or SRI and OSI storage locations. The

analysis suggests that both contractor and government furnished material ISNSL allowance additions respond in similar ways to the ISNSL/COSAL computation process. They may be responding to different factors within the ISNSL process. Unfortunately, those factors cannot be isolated with the available data.

Appendix C contains the analysis of the affects of annual BRF updating on SSBN-726 ISNSL allowance additions. This analysis separates ISNSL data into two groups; 1) those ISNSLs which were computed after an annual BRF update and 2) those ISNSLs without an intervening annual BRF update. Within each group the ISNSL data is further categorized by supplier and storage location.

Appendix C initially compares SSBN-726 ISNSL allowance additions computed after an annual BRF update. Secondly, ISNSL allowance additions not affected by annual BRF updates are compared. Finally, ISNSL additions affected by annual BRF updating are compared with those not affected by annual BRF updates.

Table 7 summarizes the results of this analysis. Table 7 contains three matrices corresponding to the three comparisons above. A "yes" in Table 7 (or follow-on Table of similar format) indicates a statistical difference ,at a 95 percent level of significance, between supplier/storage location categories. A "no" indicates no significant difference between the allowance material categories.

Based on the statistical assumptions and a 95 percent level of significance, it appears there is no significant difference between SSBN ISNSL allowance additions affected by annual BRF updating and those not affected by annual BRF updating. The only exception to the above statement concerns contractor furnished storeroom items. On the average these items experienced 18.15% ISNSL allowance additions following a BRF update and 10.79% allowance additions without a BRF update.

Intuition suggests that those ISNSL's affected by annual BRF updating should experience higher levels of allowance adjustment. A second look at the data in Appendix C verifies that, without exception, ISNSL additions affected by annual BRF updating have higher mean allowance addition percentages and greater variation within those addition percentages than ISNSLs not affected by annual BRF updating. This suggests that BRF updating may result in greater ISNSL allowance additions and perhaps overall churn. Table 8 summarizes the results.

b. SSBN-726 ISNSL Allowance Deletes.

The analysis of SSBN-726 ISNSL allowance deletions is accomplished in the same manner as allowance additions. ISNSL deletion statistics do not distinguish between SRI and OSI items. Therefore, that portion of the analysis has been omitted.

TABLE 7
APPENDIX C SUMMARY

	GF SRI	GF OSI	CF SRI	CF OSI
GF SRI	---	NO	NO	---
GF OSI	NO	---	---	NO
CF SRI	NO	---	---	NO
CF OSI	---	NO	NO	---

T Test and Analysis of Variance Results Between
Supplier/Storage Location
Annual BRF Update a Factor

	GF SRI	GF OSI	CF SRI	CF OSI
GF SRI	---	NO	NO	---
GF OSI	NO	---	---	NO
CF SRI	NO	---	---	NO
CF OSI	---	NO	NO	---

T Test and Analysis of Variance Results Between
Supplier/Storage Location
Annual BRF Update Not a Factor

	GF SRI	GF OSI	CF SRI	CF OSI
GF SRI	NO	---	---	---
GF OSI	---	NO	---	---
CF SRI	---	---	YES	---
CF OSI	---	---	---	NO

T Test and Analysis of Variance Results Between
Supplier/Storage Location
Annual BRF Update a Factor vs Not a Factor

TABLE 8
SUMMARY OF MEAN AND STANDARD DEVIATION OF SSBN-726 ISNSL
ALLOWANCE ADDITION PERCENTAGE

	Annual BRF Update A Factor		Annual BRF Update Not a Factor	
	Mean	Stdev	Mean	Stdev
GF SRI	32.9%	25.2	16.4%	11.7
GF OSI	27.0%	21.8	14.2%	16.6
CF SRI	18.15%	6.47	10.79%	4.42
CF OSI	25.97%	8.49	19.9%	14.3

Appendix D contains SSBN-726 class ISNSL allowance deletion data and statistical test results performed without regard to the affects of annual BRF updating. Appendix D's analysis addresses the question of differences between contractor and government furnished material allowance deletions. The results of a t-test and analysis of variance between contractor and government furnished material deletion percentages suggests that the ISNSL process affects them equally without regard to annual BRF updating (see Table 60 of Appendix D).

Appendix E contains allowance deletion data stratified by the affect of annual BRF updates. These tests address the question of differences between ISNSL deletions, where annual BRF updating is a factor vs ISNSL deletion not affected by BRF updating. Once again, the observations regarding the impact of BRF updating on ISNSL additions apply to ISNSL deletions. The theoretical framework within which this analysis is being conducted suggests no significant difference between deletions affected by an annual BRF update and deletions not affected by BRF updating. However, the mean and variation of ISNSL deletes affected by BRF updating is consistently greater than those not affected by updating. Table 9 summarizes the ISNSL deletion data.

TABLE 9
SUMMARY OF MEAN AND STANDARD DEVIATION OF SSBN-726 ISNSL
ALLOWANCE DELETION PERCENTAGES

	Annual BRF Update A Factor		Annual BRF Update Not a Factor	
	Mean	Stdev	Mean	Stdev
GF Deletes	14.67%	6.58	12.00%	9.92
CF Deletes	26.6%	28.3	8.82%	5.39

3. Summary

The preceding analysis of SSBN-726 class ISNSL data suggests statistical differences between the amount of churn experienced by ISNSLs affected by annual BRF updating and those unaffected by the BRF updating process.

C. THIRD FLIGHT FFG-7 ISNSL DATA ANALYSIS

This section contains an analysis of Third Flight FFG-7 class (FFG-40 through FFG-49) ISNSL data. Selected ISNSL data from early Third Flight hulls was not available for analysis. In addition, the FFG-44 was built for the Royal Australian Navy under a foreign military sales (FMS) agreement and is not included in the analysis.

The approach towards FFG-7 class ISNSL data analysis is unchanged from that used on SSBN-726 ISNSL data.

1. Correlation and Regression Analysis

Appendix F contains Third Flight FFG-7 class correlation and regression analysis. A sequence of

scatterplots for the data has been included in Appendix F. There appears to be fairly strong correlation between ISNSL additions and configuration changes (both configuration range and depth changes) on Third Flight FFG-7s. The results of multiple linear regression between ISNSL allowance additions and deletions and configuration changes and BRF updates was found to be:

$$\text{ISNSL Adds} = 2459 + 1.09(\text{Config Range}) + 0.470(\text{Config Depth}) + 502(\text{BRF Update Indicator})$$

The test statistics for this relationship were:

$$s = 993.2 \quad R\text{-sq} = 83.1\%$$

The relationship between ISNSL allowance deletions and configuration range changes and BRF updating was found to be:

$$\text{ISNSL Deletes} = 2331 + 0.302(\text{Config Range}) + 2214(\text{BRF Update})$$

The test statistics for this relationship were:

$$s = 1578 \quad R\text{-sq} = 38.6\%$$

2. Mean Comparison and Analysis of Variance

The procedures used for comparison of means and variance on the Third Flight FFG-7 class ISNSL is also unchanged from the SSBN-726 Class approach.

a. Third Flight FFG-7 ISNSL Allowance Additions

Appendices G and H contain data and test results on Third Flight FFG-7 class ISNSL allowance additions. Appendix G addresses ISNSL additions without regard to annual BRF updating and attempts to isolate differences

between government/contractor and storeroom/operating space repair parts. Appendix H refines the analysis by distinguishing between ISNSL data affected by annual BRF updating and ISNSL data not affected by BRF updating.

The analysis of Third Flight FFG-7 class data indicates the following relationships regarding ISNSL additions:

- 1) Government and contractor furnished storeroom items experience about the same percentage of ISNSL additions.
- 2) Government furnished storeroom items experience a significantly greater percentage of ISNSL additions than government furnished operating space items.

Table 10 summarizes these results.

TABLE 10
APPENDIX G SUMMARY

	Mean	Stdev
GF SRI	26.89%	14.92
GF OSI	13.45%	9.16
CF SRI	26.40%	11.10
CF OSI	21.30%	11.08

Third Flight FFG-7 Class
Summary of ISNSL Addition Percentages

	GF SRI	GF OSI	CF SRI	CF OSI
GF SRI	---	YES	NO	---
GF OSI	YES	---	---	YES
CF SRI	NO	---	---	NO
CF OSI	---	YES	NO	---

Third Flight FFG-7 Class ISNSL Additions Test and Analysis
of Variance Between Supplier/Storage Location

The difference between GF SRI and GF OSI allowance additions initially appears troublesome. However, as discussed earlier, a possible explanation for this difference is the manner in which stockage of storeroom and operating space items are computed. Generally, storeroom item allowances are computed via the full COSAL model criterion, whereas operating space items bypass much of this model. Stockage allowance for OSI are generally determined via override or note code data. Because operating space items are insulated from much of the computation model criterion, (including BRF) lower ISNSL additions for OSI spares may result.

Appendix H contains the analysis of Third Flight FFG-7 ISNSL allowance additions when annual BRF updating is considered. Once again, this analysis separates the ISNSL data into two groups; ISNSL data obtained after an annual BRF update and ISNSL data obtained without an intervening BRF update. With Third Flight FFG-7 data, the effects of BRF updating on ISNSL allowance additions are distinct. Both government furnished operating space and government furnished storeroom allowance items experience significantly greater ISNSL additions after an annual BRF update. The affects of BRF updating on contractor furnished allowance items are noticeable but less dramatic. Table 11 summarizes these findings.

TABLE 11
APPENDIX H SUMMARY

	Annual BRF Update A Factor		Annual BRF Update Not a Factor	
	Mean	Stdev	Mean	Stdev
GF SRI	32.09%	14.13	19.61%	11.52
GF OSI	16.72%	9.00	8.88%	7.56
CF SRI	29.29%	11.52	22.36%	9.57
CF OSI	21.69%	12.45	19.76%	7.66

Third Flight FFG-7 Class
Summary of Mean and Standard Deviation ISNSL Allowance
Additions

	GF SRI	GF OSI	CF SRI	CF OSI
GF SRI	YES	---	---	---
GF OSI	---	YES	---	---
CF SRI	---	---	NO	---
CF OSI	---	---	---	YES

T Test and Analysis of Variance Results Between
Supplier/Storage Location
Annual BRF Update a Factor vs Not a Factor

b. Third Flight FFG-7 ISNSL Allowance Deletions

This section contains Third Flight FFG-7 class ISNSL allowance deletion data analysis. Appendix I attempts to distinguish differences between government and contractor furnished ISNSL deletions on Third Flight FFG-7s. The results of these tests suggest no difference between the percentages of deletions experienced by GF and CF material on Third Flight FFG-7s (see Table 95 of Appendix I).

Appendix J contains Third Flight FFG-7 allowance deletion data analysis stratified by the affect of annual BRF updating. These tests compare ISNSL deletes where annual BRF updating is a factor and ISNSL deletes unaffected by annual BRF updating. The results of these tests suggest that contractor furnished material experiences substantially fewer ISNSL deletes when not affected by annual BRF updating. Government furnished material data is far less conclusive, perhaps due to the effect of an apparent outlier in FFG-42's 4th ISNSL. Figure 8 illustrates the dramatic affect FFG-42's 4th ISNSL has on this analysis. Table 12 summarizes Appendix J.

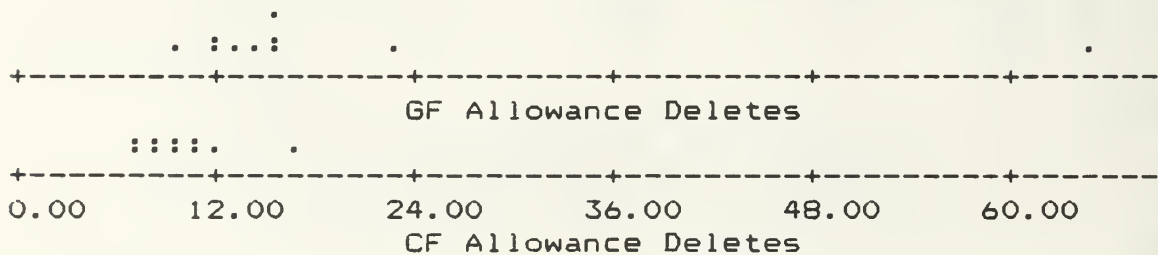


Figure 8. Third Flight FFG-7 GF vs CF ISNSL Allowance Deletions Dotplot - Annual BRF Update Not a Factor

TABLE 12
SUMMARY OF MEAN AND STANDARD DEVIATION OF THIRD FLIGHT FFG-7
ISNSL ALLOWANCE DELETIONS

	Annual BRF Update A Factor		Annual BRF Update Not a Factor	
	Mean	Stdev	Mean	Stdev
GF Deletes	21.93%	5.12	19.14%	16.1
CF Deletes	21.66%	2.49	10.0%	2.79

3. Summary

The analysis of Third Flight ISNSL data suggests a higher percentage of ISNSL churn and greater variation of ISNSL churn on those ISNSL stockage allowance computed after an annual BRF update when compared to ISNSL allowances computed without an intervening BRF update. Additionally, the analysis indicates that operating space items experience less churn and are less affected by BRF updating than storeroom items. This observation indicates that changes to allowance computation related data elements within the Maintenance Data File (MDF) and Program Support Interest File (PSI) may have greater impact on ISNSL churn than minor configuration changes to the Weapon Systems File (WSF).

D. FOURTH FLIGHT FFG-7 ISNSL DATA ANALYSIS

This section contains an analysis of Fourth Flight FFG-7 class (FFG-50 through FFG-60) ISNSL data. ISNSL data from FFG-59 and FFG-60 was not available at the time of this research.

1. Correlation and Regression Analysis

Appendix K contains the Fourth Flight FFG-7 class correlation and regression analysis. A series of scatterplots in Appendix K supports the correlation table and follow-on regression analysis. No single factor stands out as correlating well with either ISNSL allowance

additions or deletions on Fourth Flight FFG-7s. The use of multiple linear regression analysis is also of limited value. The multiple regression between ISNSL additions and deletions and configuration changes and the BRF update indicator yielded the following equations:

$$\text{ISNSL Adds} = 3170 + 2.17(\text{Config Range}) - 0.305(\text{Config Depth}) + 725(\text{BRF Update Indicator})$$

The statistics for this relationship were:

$$s = 695.6 \quad R\text{-sq} = 40.2\%$$

The relationship between ISNSL deletions and configuration range changes and BRF updating was found to be:

$$\text{ISNSL Deletes} = 1931 + 0.62(\text{Config Range}) + 0.001(\text{Config Depth}) + 1318(\text{BRF Update})$$

The statistics for this relationship were:

$$s = 505.1 \quad R\text{-sq} = 69.9\%$$

2. Mean Comparison and Analysis of Variance

The procedures used for Fourth Flight FFG-7 class ISNSL data mean comparisons and variance analysis remains unchanged from previous analyses.

a. Fourth Flight FFG-7 ISNSL Allowance Additions

Appendices L and M contain data and test results on Fourth Flight FFG-7 class ISNSL allowance additions. Appendix L addresses ISNSL additions without regard to annual BRF updating and attempts to isolate differences between government/contractor and storeroom/operating space repair parts. Appendix M refines the analysis by

distinguishing between ISNSL data affected by annual BRF updating and ISNSL data not affected by BRF updating.

Fourth Flight FFG-7 class data suggests the following relationships regarding ISNSL additions:

- 1) Government and contractor furnished storeroom items experience about the same percentage of ISNSL additions.
- 2) Government and contractor furnished operating space items experience about the same percentage of ISNSL additions.
- 3) Government and contractor furnished storeroom items experience a significantly greater percentage of ISNSL additions than government and contractor furnished operating space items.

These observations support those for Third Flight FFG-7s and extend the difference between storeroom and operating space items to contractor furnished material. Table 13 summarizes the analysis of Appendix L.

The difference between SRI and OSI ISNSL allowance additions is clearly noticeable on Fourth Flight FFG-7s. Once again, a possible explanation for this difference is the manner in which stockages for storeroom and operating space items are computed. Because operating space items are insulated from much of the computation model's criterion (including BRF) lower ISNSL additions for OSI spares is

logical. The criterion considered by the COSAL computation model (maintenance level, item population, BRF, price, etc.)

TABLE 13
APPENDIX L SUMMARY

	Mean	Stdev
GF SRI	21.43%	6.15
GF OSI	8.73%	4.89
CF SRI	19.97%	5.98
CF OSI	7.73%	3.03

Fourth Flight FFG-7 Class
Summary of ISNSL Addition Percentages

	GF SRI	GF OSI	CF SRI	CF OSI
GF SRI	---	YES	NO	---
GF OSI	YES	---	---	NO
CF SRI	NO	---	---	YES
CF OSI	---	NO	YES	---

Fourth Flight FFG-7 Class ISNSL Additions
Summary of Test and Analysis of Variance Between
Supplier/Storage Location

are also the data elements within the MDF, PSI and WSF Level C which are subject modification. It follows that if operating space items are insulated from much of the ISNSL/COSAL computation process then they should also be insulated from much of the ISNSL/COSAL churn resulting from changes in item data within the files considered by the computation model.

Appendix M contains the analysis of Fourth Flight FFG-7 ISNSL allowance additions when annual BRF updating is considered. Once again, this analysis separates the ISNSL data into two groups; ISNSL data affected by

annual BRF updating and ISNSL data not affected by BRF updating. On Fourth Flight FFG-7 class ships the affects of BRF updating on ISNSL allowance additions is less distinct than on Third Flight FFG-7s. Only government furnished operating space and contractor furnished storeroom allowance items experience significantly greater ISNSL additions after an annual BRF update. Table 14 summarizes Appendix M.

TABLE 14
APPENDIX M SUMMARY

	Annual BRF Update A Factor		Annual BRF Update Not a Factor	
	Mean	Stdev	Mean	Stdev
GF SRI	23.04%	6.09	19.62%	6.08
GF OSI	10.33%	3.95	5.69%	4.13
CF SRI	23.84%	4.49	15.60%	4.20
CF OSI	8.68%	3.96	6.65%	0.77

Fourth Flight FFG-7 Class
Summary of Mean and Standard Deviation ISNSL Allowance
Additions

	GF SRI	GF OSI	CF SRI	CF OSI
GF SRI	NO	---	---	---
GF OSI	---	YES	---	---
CF SRI	---	---	YES	---
CF OSI	---	---	---	NO

Fourth Flight FFG-7 Class
Summary of T Test and Analysis of Variance Results Between
Supplier/Storage Location
Annual BRF Update a Factor vs Not a Factor

b. Fourth Flight FFG-7 ISNSL Allowance Deletions

Appendix N contains Fourth Flight FFG-7 class ISNSL allowance deletion data and the associated statistical tests. As with previous analysis, Appendix N attempts to distinguish differences between government and contractor furnished material ISNSL deletions on Fourth Flight FFG-7s. The results of these tests suggest that there is no difference between the percentage of allowance deletions experienced by GF and CF material on Fourth Flight FFG-7s (see Table 131 of Appendix M).

Appendix O describes the analysis of allowance deletions for Fourth Flight FFG-7s stratified by the affect of annual BRF updating. this analysis addresses the issue of ISNSL deletes where annual BRF updating is a factor vs ISNSL deletes where annual BRF updating is not a factor. The results of these tests suggest that government and contractor furnished material experience substantially fewer ISNSL deletes when not affected by annual BRF updating. Table 15 summarizes Appendix O.

TABLE 15
SUMMARY OF MEAN AND STANDARD DEVIATION OF FOURTH FLIGHT
FFG-7 ISNSL ALLOWANCE DELETION PERCENTAGES

	Annual BRF Update A Factor		Annual BRF Update Not a Factor	
	Mean	Stdev	Mean	Stdev
GF Deletes	16.63%	2.95	11.21%	3.14
CF Deletes	19.85%	3.96	8.09%	3.33

3. Summary

As with the analysis of Third Flight FFG-7 ISNSL data, Fourth Flight ISNSL data suggests a greater difference between the churn experienced by ISNSLs affected by annual BRF updating. The Fourth Flight data also reinforces the notion that operating space items experience less churn and are less affected by BRF updating than storeroom items. This observation shows that changes to data elements related to allowance computation within the Maintenance Data File (MDF) and Program Support Interest File (PSI) may have greater impact on ISNSL churn than minor configuration changes.

E. FFG-7 AND SSBN-726 ISNSL CHURN COMPARISON

Perhaps the most significant analysis on the impact of configuration changes and annual BRF updates on ISNSL churn is made by comparing FFG-7 and SSBN-726 ISNSL data.

The SSBN-726 and FFG-7 class ships are supported by very similar COSAL computation models. FFG-7's receive allowances based on the Maintenance Criticality Oriented (MCO) computation model while SSBN-726 submarine allowances are based on the Trident model. Both models are variable protection level algorithms and consider similar factors in item computation (item population, equipment criticality, replacement factor, maintenance level, price, etc.).

Because of these similarities, it is unlikely that differences between FFG-7 and SSBN-726 ISNSL churn arise from different COSAL models.

Both FFG-7 and SSBN-726 programs use the FOMIS configuration loading method. Differences between stockage level computations in the two programs may arise when configuration control and standardization is considered.

The Trident submarine program is highly standardized and exercises close control on configuration. The FFG-7 program is not as closely managed regarding standardization or configuration control. Additionally, SSBN-726 submarine configuration is developed by a single activity while FFG-7 ship configuration is done by multiple activities.

With the above considerations in mind, if configuration management is a primary factor in ISNSL churn, one would expect SSBN-726 submarines to experience less churn than FFG-7 ships. Since both programs use similar COSAL models and are therefore equally affected by changes to the MDF, PSI and other allowance computation related files it follows that any differences must be due to differences in configuration management.

Appendix P compares contractor furnished ISNSL deletions between SSBN-726 and FFG-7 shipbuilding programs. This analysis suggests no statistically significant differences in the levels of ISNSL churn between shipbuilding programs (see Tables 139 and 141 of Appendix P). Based on these

results it appears ISNSL churn is more closely related to data changes within the MDF and PSI (including the annual BRF update) than configuration adjustments.

F. ISNSL CHURN DEPTH

All prior analysis of ISNSL allowance data considered only range additions and deletions. The issue of allowance addition and deletion depth was not included. The purpose of this section is to describe and discuss the impact of depth on ISNSL churn and ISNSL deletions in particular.

Range is a measure of the number of different items of supply in an inventory. Depth is a measure of the total number of items of supply in an inventory. For example, your silverware drawer may have a range of three items (knife, fork, and spoon) and a depth of twenty-four items (eight knives, forks and spoons).

ISNSL allowance adjustments (additions or deletions) can affect either range or depth. Range additions indicate the computation of a repair part for stockage that previously did not compute for stockage. Depth additions add more of the same item to a ship's support inventory. Allowance item range and depth additions result from configuration additions (adding new equipment to a Weapons System File) or changes to the MDF/PSI which affect item computation. Range deletions remove all items of a particular type from

allowance. Depth deletions remove only some items of a particular type from allowance.

An understanding of ISNSL deletions from a range and depth point of view may be helpful in determining the cause of excess allowance materials during the ship outfitting period. Table 16 summarizes the FFG-57's 2nd ISNSL allowance deletions. The "Total Range of Items Deleted" represents the number of different NSNs deleted, either in range or depth on the ISNSL. The "Total Depth of Items Deleted" is the total number of items deleted from stockage by the ISNSL. The "Number of Range Deletes" represents the NSNs which were entirely deleted from stockage (reduced to a zero quantity). The "Number of Depth Deletes" is the number of NSNs which decreased in allowance quantity (e.g., a reduction from a stockage level of 5 to a stockage level of 4).

Perhaps the most significant point about FFG-57's 2nd ISNSL is that over half the deletions involve depth only. In other words, over half the time ISNSL deletions involve decreasing the quantity of an existing allowance item rather than removing the item completely from onboard inventories. This suggests that the deleted items remain applicable to installed equipment and the reasons for deletion are either equipment population reductions or changes to computation related data elements within the MDF or PSI. Minor depth

TABLE 16
FFG-57 SECOND ISNSL ALLOWANCE DELETIONS

Contractor Furnished Material Deletes

Total Range of Items Deleted	628
Total Depth of Items Deleted	1231
Number of Range Deletes	283
Number of Depth Deletes	345
Number of Deletes Involving a	
Quantity of 1 (Range or Depth)	474
Total Number of Navy Cog Affected	47
Total Number of DLA Cog Affected	581
Items Less Than \$10.00 each	349
Items Between \$10.00 and \$1000.00 each	270
Items Greater Than \$1000.00 each	9

Government Furnished Material Deletes

Total Range of Items Deleted	2094
Total Depth of Items Deleted	4700
Number of Range Deletes	994
Number of Depth Deletes	1100
Number of Deletes Involving a	
Quantity of 1 (Range or Depth)	1565
Total Number of Navy Cog Affected	242
Total Number of DLA Cog Affected	1852
Items Less Than \$10.00 each	662
Items Between \$10.00 and \$1000.00 each	1329
Items Greater Than \$1000.00 each	103

decreases for items with continued onboard application suggests that the ISNSL process may be too sensitive to small adjustments to the MDF and PSI.

An additional consideration regarding depth deletions involves the notion of item application. Clearly, if an allowance item is being deleted in depth only, it still has application to an installed equipment. In the absence of changes to equipment maintenance strategies or erroneous configuration accounting, it seems logical to leave support material onboard once it has computed for allowance rather

than adjust the allowance document, cancel orders and place received material in excess.

An analysis of ISNSL depth additions has similar results. That is, many allowance additions are depth increases only. However, most Project Managers are not as concerned with adding support material onboard ships as they are with removing allowance material which has already been requisitioned from the supply system or bought by the shipbuilder.

It appears that most ISNSL churn involves minor changes to allowance depth quantities. Depth and range changes result from both configuration adjustments and changes to inventory management data in the MDF, PSI, etc. However, allowance depth changes alone, do not generally result from the total deletion of an equipment from a ship's configuration index. On the other hand, range changes are more closely associated with the addition or deletion of an equipment from a ship's WSF configuration. Viewing ISNSL churn from this perspective may provide insight into the accumulation of excess outfitting material and suggest possible corrective action.

G. ADMINISTRATIVE ISNSL CHURN VS EXCESS MATERIAL

ISNSL allowance deletions don't necessarily result in excess materials. In some sense, excess material is a subset of ISNSL allowance deletions. Inspection of SSBN-726

and FFG-7 class ISNSL deletion statistics reveals a tremendous dollar value and item count in deleted allowance material during the allowance development period. For all ISNSL deletions to result in excess material, each allowance item authorized on an ISNSL would have to be ordered and shipped prior to computation of the next ISNSL. Obviously not all allowance material is ordered and shipped prior to computation of the next ISNSL.

ISNSL allowance addition and deletion statistics are also referred to as "Administrative Churn". Administrative churn represents all the changes to a ship's ISNSL allowance during the outfitting period. Administrative churn reflects the effort needed by the outfitting activity to order, cancel, receive, bin or adjust a ship's support material allowance.

The dollar value and item count of ISNSL allowance deletions is significant but can be misleading. The FFG-57's second ISNSL identified 2600 deletions with a total value exceeding two million dollars. Of these deletes, 1% or 27 items represented 79% (1.6 million dollars) of the dollar value, while 85% of the deleted items cost less than \$100.00 each. Most high dollar value items were not issued to the outfitting activity by the supply system prior to issuance of the next ISNSL.

ISNSL allowance deletes do not equate to excess outfitting materials for a number of reasons. For many

items, particularly high cost repairables managed by SPCC, ISNSL deletes are successfully canceled prior to material shipment. The outfitting requisitions for high value/short supply repairable components are often backordered by the Inventory Control Point until the ship is close to completion and delivery.

A high dollar value filter of all allowance items is performed by the ISNSL program. This filter passes allowance item characteristics through a decision table to identify items with unusually high prices or large allowance quantities. The parameters of the decision table are set by FMSD based on guidance from NAVSUP and NAVSEA. The settings distinguish between consumable and repairable items. Consumable item settings are; 1) an allowance quantity greater than 20, 2) a unit price greater than \$200 or 3) an extended price greater than \$1200. Repairable item settings are; 1) an allowance quantity greater than 10, 2) a unit price greater than \$1000 or 3) an extended price greater than \$2000. [Ref. 16]

The ISNSL program produces a high dollar value listing which is reviewed by the Naval Sea Logistic Support Engineering Activity (NAVSEALOGSUPENGACT) after each ISNSL computation and before material is requisitioned. Many high cost items are caught by this process and never ordered. However, the ISNSL program reflects filtered item adjustments as a delete on subsequent allowance documents.

Finally, the ISNSL program contains a residual asset application routine which matches excess material from previous new construction ships against current ISNSL requirements. This application reuses excess materials from early shipbuilding.

ISNSL allowance deletion or administrative churn potentially causes excess outfitting materials. Most high cost items are prevented from becoming excess outfitting assets by performing management reviews of ISNSL allowances prior to placing material on order, by requisition processing policies at the ICPs, by guidance to outfitting activities from Program Managers and by excess asset application routines. However, in spite of efforts to reduce excess materials significant amounts of residual asset continue to accumulate.

H. SUMMARY

This chapter has looked at the ISNSL churn statistics from SSBN-726 class submarines and FFG-7 class surface ships in an effort to identify factors contributing to excess outfitting materials. A series of statistical tests were conducted on this data to determine the relationships between ISNSL churn, configuration changes and annual BRFF updating. Correlation, regression and mean comparisons were the primary statistical tools of the analysis. Regression and correlation analysis indicated no consistently strong

relationship between ISNSL churn and configuration changes or BRF updating.

Comparing the average churn between ISNSL's affected by annual BRF updating to those not affected by BRF updating generally indicated that the annual BRF adjustments resulted in substantially higher churn. The composition of ISNSL adjustments, distinction between range and depth and the impact of these adjustment on overall support was reviewed. The distinction between ISNSL churn statistics or "Administrative Churn" and actual excess materials was discussed.

The purpose of the research and analysis in this chapter has been descriptive rather than predictive in nature. The factors and variables that affect ISNSL/COSAL allowance computation are numerous and varied. A ship's Weapons System File configuration index is changing almost daily.

The MDF and PSI are exceptionally dynamic files. The MDF alone receives 750,000 to 1.5 million changes each month. An appreciation of the complexity and intricacy of the allowance development process is needed before an attempt to suggest improvements, enhancements or alternative procedures can be made.

V. CONCLUSIONS AND RECOMMENDATIONS

Over the last several years, the Navy has recognized that large volumes of excess spares and repair parts result from Ship Construction Navy (SCN) shipbuilding programs. Increased awareness and concern over Department of Defense spare parts procurement and management practices have provided an environment in which the SCN allowance development processes requires scrutiny. The purpose of this final chapter is to offer some conclusions and recommendations arising from the research.

A. CONCLUSIONS

The primary conclusions arising from this research are offered in the next few paragraphs. Supporting conclusions may be drawn from the preceding chapters.

1. SCN Allowance Development and Outfitting Process

Throughout this research the complexity of the procurement, provisioning and allowance development processes has been discussed. The business of building and outfitting sophisticated weapon systems is neither simple nor sequential. The procedures and programs which support this process are equally complex and any efforts to modify this system must be approached in a cautious and systematic manner.

2. Excess Outfitting Materials

The accumulation of excess outfitting materials is a substantial problem for NAVSEA managed shipbuilding programs. Although many excesses originate in the ISNSL program, evidence suggests that there are other contributing factors. One cause of excess outfitting material not directly related to the ISNSL process are Type III spares sent to the outfitting activity to support government furnished equipment. Type III spares apply to government furnished equipment supported by the equipment's manufacturer. This method of support is used for new equipment which has not completed the provisioning process.

3. ISNSL Churn

The causes of ISNSL churn are difficult to isolate for two reasons. First, the files involved in ship allowance computation (WSF, MDF, and PSI etc.) are tremendously volatile. Although modification and access to the WSF for new ship's is restricted to the Ship Acquisition Project Manager (SHAPM) or designated reporting activities, a large volume of configuration records are established, modified or deleted over the outfitting period. The MDF and PSI experience an average of between 750,000 and 1.5 million maintenance transactions monthly.

Secondly, the computation models used by the ISNSL process consider multiple variables. As these variables change independently it becomes increasingly difficult to

determine the cause of ISNSL allowance additions or deletions without considering each item of supply individually.

For the purpose of this research, consideration of the causes of ISNSL churn have been limited to configuration changes and annual Best Replacement Factor adjustments. With configuration changes, ISNSL deletions occur due to changes in the ship's configuration index within the WSF Level A between ISNSLs. These configuration changes may be due to equipment additions, change outs, removals, validation results or correction of reporting errors.

BRF changes are a subset of the changes to the MDF, PSI and WSF Level C. These changes are related to spare and repair parts and include price, maintenance code, note code and unit of issue changes in additions to BRF modification.

4. Configuration and ISNSL Churn

The analysis of ISNSL data on SSBN-726 and FFG-7 classes was largely inconclusive regarding the relationship between ISNSL churn and configuration changes during the allowance development period. Common sense and intuition suggests that excessive configuration reporting errors would result in greater ISNSL churn since erroneous configuration records and associated parts support would require removal from affected stockage allowances. However, there is no statistically significant evidence pointing towards frequent configuration reporting errors of this type.

Although both the SSBN-726 and the FFG-7 programs use FOMIS to build WSF configuration, there are noteworthy differences. First, SSBN-726 FOMIS reporting is done by a single activity for all types of equipment. FFG-7 class FOMIS configuration reporting responsibilities are divided among four activities. The three FFG-7 shipyard supervisors report contractor furnished (CF) configuration while the project manager centrally reports all government furnished (GF) equipment configuration.

Secondly, the standardization and management controls placed on the SSBN-726 program (because of its strategic importance) are more rigid than those used in the FFG-7 program. Given the greater configuration control in the SSBN-726 program, there is no evidence that SSBN-726 class submarines experience less ISNSL churn than FFG-7s.

5. Best Replacement Factor (BRF) and ISNSL Churn

In every COSAL computation model currently in use, except nuclear support models, the Best Replacement Factor (BRF) is a critical determinant of allowance item computations. Once again, intuition would suggest that changing item BRFs between ISNSL computations would result in greater allowance adjustments than if BRF were to remain fixed. All ISNSL data analyzed for this research suggests that BRF and ISNSL churn are related. Fourth Flight FFG-7 class data indicates in a rather convincing manner that annual BRF updating results in significant increases in

ISNSL churn. In some cases this was twice as much ISNSL churn. It appears that any effort to reduce ISNSL churn and resulting excess outfitting assets must address the manner in which the Best Replacement Factor is adjusted or used by the ISNSL process.

B. RECOMMENDATIONS

The primary emphasis throughout this thesis has been to investigate SCN shipbuilding program allowance list development procedures and the excess allowance materials resulting from the outfitting process. This emphasis has included an investigation of the ISNSL process and supporting programs. The following recommendations fall into two categories; symptomatic recommendations and system recommendations.

1. Symptomatic Recommendations

The following recommendations address areas external to the ISNSL/COSAL allowance development process. Given that a certain amount of residual or "left over" material may be an undesired, but necessary, part of the initial outfitting business, these recommendations concern ways to avoid or manage excesses better.

a. Deferred Requisitioning

Implement existing COSAL deferred requisitioning procedures on SCN initial outfitting requisitions. Deferred requisitioning procedures code each material order with a

future required delivery date (RDD). The deferred requisitioning program was developed to prevent the unplanned drawdown of wholesale supply system assets by retail activities (ships) subsequent to allowance document changes. Under the deferred concept the Inventory Control Point (ICP) suspends material issue for initial outfitting requirements for the lesser of a material procurement lead time or the required delivery date.

Implementing deferred requisitioning procedures for SCN outfitting material would allow the ICP visibility of initial allowance requirements for procurement purposes, maintain wholesale supply system inventories for forecasted recurring demand and prevent premature material issue early in the outfitting cycle. (Requirements which may subsequently be canceled by future ISNSL computations.)

b. Automated ISNSL Processing

Most NAVSEA field activities process ISNSL products manually. The administrative costs and lost time involved with handling thousands of ISNSL punched cards and listings by hand is high but difficult to quantify. Above the costs of residual materials caused by excessive ISNSL churn is the administrative costs of ordering and canceling material throughout the supply system. Developing a standard automated ISNSL processing system and eliminating punched cards and reams of listings would significantly enhance the SCN outfitting process.

c. BRF Update Methods and ISNSL Program Interface

The manner in which Best Replacement Factors are updated has been under review for some time. In the past, BRFs have been annually adjusted using a weighted average technique. This method was thought to be too sensitive to the previous years' usage data and had a tendency to change BRFs unnecessarily (it usually lowered them). After completion of a BRF Study by the Fleet Material Support Office in 1983, a revised BRF adjustment technique using a ratio computation was recommended.

The BRF's impact on ISNSL churn is but one consideration in determining preferred method of BRF updating. A decision on BRF updating has been deferred pending additional study on the effects of each method of update on COSAL effectiveness, cost and fleet readiness. If the BRF remains a volatile data element, then the manner in which the ISNSL process uses BRF data should be reviewed.

d. Standardized/Centralized Residual Asset Management

Each major shipbuilding program handles excess outfitting materials differently. Within shipbuilding programs, excess assets "owned" by one program manager are not easily visible to other program managers for application to outfitting requirements. Not all shipbuilding programs participate in the ISNSL residual asset application routine. The inventory management resources and techniques applied to

excess assets is limited and duplicative in nature. Given that a certain amount of excess material is inherent to the SCN allowance development process, economies of scale and increased reuse of residual assets may be achievable with standard and centralized excess asset management.

e. Minimize ISNSLs

The SSBN-726 class submarine program currently runs two ISNSL computations during initial allowance development. The number of ISNSL computations needed to develop adequate supply support is a function of a number of factors, including equipment provisioning and configuration development progress. To the extent that these processes can be expedited and the number of ISNSLs reduced, ISNSL churn related excess materials will decrease.

2. Systems Recommendations

In contrast to symptomatic recommendations, systems recommendations address areas within the ISNSL allowance development process. The primary systems recommendation involves a review of the ISNSL programs to reduce sensitivity to configuration and non-configuration files changes. The purpose of the ISNSL process is to develop initial supply support. That support is designed to achieve the highest degree of equipment readiness consistent with funding and maintenance strategy considerations. The continual churning of allowance items during the outfitting period does not aid in achieving this goal.

In the past, computer capacity and software constraints have prohibited redesign of many UICP programs, including the ISNSL. Major hardware upgrades at SPCC along with comprehensive software resystemization will permit substantial program redesign in the future. Success in redesigning the ISNSL program hinges on the ability of it's users to articulate existing systems shortcomings accurately and recommend needed enhancements. The following recommendations outline several alternative improvements to the ISNSL process.

a. ISNSL Allowance Protection

Develop a method to protect allowance items from subsequent ISNSL deletion if the repair part remains applicable to installed equipment. Once an item computes for allowance and is requisitioned from the supply system or bought by the shipbuilder, it makes little sense to remove it from the ship because of minor fluctuations in BRF, price or other factors. If an item computed for allowance at one time, remains applicable to installed equipment, and has been ordered and/or received at the shipyard it seems both logical and beneficial to stock the item.

b. Exception Coding

Develop an exception coding system for all ISNSL additions and deletions to provide statistical data on what caused ISNSL churn and the equipment associated with the churn. This would allow research of allowance adjustments,

prevent erroneous orders or cancellations, permit trend analysis and identify problem areas.

c. Inhibit Depth Churn

Once an item has computed for allowance in a specified quantity, suppress routine depth additions and deletions unless additional information suggests an adjustment is required. The SSBN-726 program has implemented this concept in Trident submarine COSAL maintenance. Basically, each Trident submarine receives a new allowance document quarterly. This document is known as a Trident COSAL work package.

Although the Trident COSAL maintenance program is currently labor intensive, it has some features which may be beneficial to traditional allowance development procedures. The Trident COSAL maintenance process matches a submarine's current WSF configuration with the last COSAL and identifies new equipment additions and deletions. From these equipment changes an allowance item addition and deletion candidate listing is developed. The candidate listing is then compared with the submarine's current allowance list to determine needed adjustments. As a general rule, only range additions and deletions are made during this process. An allowance addition candidate already onboard or an allowance deletion candidate with remaining application will be suppressed from maintenance action.

d. Control UICP Files Maintenance

Develop MDF and PSI control mechanisms for allowance computation sensitive data elements. Currently many data elements within the MDF and PSI are subject to modification by ICP without management control or audit trails. Data elements like the BRF have significant impact on the level of support received afloat. The ability to manually adjust BRFs for short term requirements is not in the best interests of the supply system or fleet readiness. An adequate methodology needs to be developed to monitor files maintenance actions and prevent inappropriate changes without unnecessarily reducing systems flexibility and responsiveness.

APPENDIX A

SSBN-726 CORRELATION AND REGRESSION ANALYSIS

TABLE 17
SSBN-726 REGRESSION AND CORRELATION DATA

Independent Variables					Dependent Variables		
Hull	ISNSL	Config Range	Config Depth	BRF Update	Adds	Deletes	Total Churn
727	2	53	264	1	3104	2655	5759
727	3	84	380	0	1006	2458	3464
727	4	32	392	0	1298	618	1916
727	5	0	113	1	1971	2551	4522
727	6	14	282	0	2325	1205	3530
729	2	52	224	1	2454	2194	4648
729	3	370	433	0	2382	1065	3447
730	2	223	2867	0	3025	2022	5047
730	3	386	381	1	4542	1984	6526
731	2	9	330	0	1272	1015	2287
731	3	68	135	1	2062	2144	4206
733	2	300	993	1	7768	6945	14713

TABLE 18
SSBN-726 CORRELATION TABLE

	Config Range	Config Depth	Adds	Deletes	Adds+Deletes
Config Depth	0.354				
Adds	0.623	0.272			
Deletes	0.302	0.171	0.840		
Adds+Deletes	0.492	0.234	0.964	0.954	
BRF Update	0.076	-0.295	0.500	0.539	0.540

TABLE 19
SSBN ISNSL ALLOWANCE ADDITIONS VS ALLOWANCE DELETIONS
T TEST AND ANALYSI OF VARIANCE

ISNSL Adds vs ISNSL Deletes T Test

	N	MEAN	STDEV	SE MEAN
ISNSL Adds	12	2767	1844	532
ISNSL Deletes	12	2238	1628	470

95 PCT CI FOR MU ISNSL Adds - MU ISNSL Deletes: (-948, 2007)
TTEST MU ISNSL Adds = MU ISNSL Deletes (VS NE): T=0.75
P=0.46 DF=21.7

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	1681691	1681691	0.56
ERROR	22	66568176	3025826	
TOTAL	23	68249856		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	---+-----+-----+-----+--
ISNSL Adds	12	2767	1844	(-----*-----)
ISNSL Deletes	12	2238	1628	(-----*-----)
				---+-----+-----+-----+--
POOLED STDEV =	1739		1500	2250 3000 3750

TABLE 20
SSBN-726 ISNSL ALLOWANCE ADDITIONS
MULTIPLE LINEAR REGRESSION

The regression equation is:

$$\text{ISNSL Adds} = 638 + 6.21(\text{Config Range}) + 0.626(\text{Config Depth}) + 1902(\text{BRF Update Indicator})$$

Predictor	Coef	Stdev	t-ratio
Constant	638.1	694.8	0.92
Config Range	6.215	2.913	2.13
Config Depth	0.6256	0.5836	1.07
BRF Update	1902.3	795.2	2.39

s = 1289 R-sq = 64.5%

Analysis of Variance

SOURCE	DF	SS	MS
Regression	3	24121280	8040426
Error	8	13285778	1660722
Total	11	37407056	

SOURCE	DF	SEQ SS
Config Range	1	14502616
Config Depth	1	113409
BRF Update	1	9505259

TABLE 21
SSBN-726 ISNSL ALLOWANCE DELETIONS
MULTIPLE LINEAR REGRESSION

The regression equation is:

$$\text{ISNSL Deletes} = 690 + 1.66(\text{Config Range}) \\ + 0.646(\text{Config Depth}) + 1924(\text{BRF Update Indicator})$$

Predictor	Coef	Stdev	t-ratio
Constant	690.5	777.8	0.89
Config Range	1.657	3.261	0.51
Config Depth	0.6462	0.6533	0.99
BRF Update	1923.8	890.1	2.16

s = 1443 R-sq = 42.9%

Analysis of Variance

SOURCE	DF	SS	MS
Regression	3	12512645	4170881
Error	8	16648552	2081069
Total	11	29161184	

SOURCE	DF	SEQ SS
Config Range	1	2652620
Config Depth	1	138774
BRF Update	1	9721251

APPENDIX B

SSBN-726 ISNSL ALLOWANCE ADDITIONS

TABLE 22
SSBN-726 GF SRI AND GF OSI ISNSL ALLOWANCE ADDITIONS

Hull	ISNSL	GF/SRI Allw	GF/SRI Addds	GF/SRI Addds %	GF/OSI Allw	GF/OSI Addds	GF/OSI Addds %
727	2	4535	1428	31.4884	2204	494	22.4138
727	3	3332	411	12.3349	2193	51	2.3256
727	4	3480	359	10.3161	2163	172	7.9519
727	5	3527	653	18.5143	2275	339	14.9011
727	6	3885	1011	26.0231	2580	442	17.1318
729	2	4265	955	22.3916	3113	435	13.9737
729	3	4310	445	10.3248	3074	177	5.7580
730	2	3733	1318	35.3067	2650	1233	46.5283
730	3	4339	1309	30.1682	3246	1088	33.5182
731	2	4054	173	4.2674	3182	173	5.4368
731	3	4299	532	12.3750	2653	251	9.4610
733	2	4258	3499	82.1747	3209	2184	68.0586

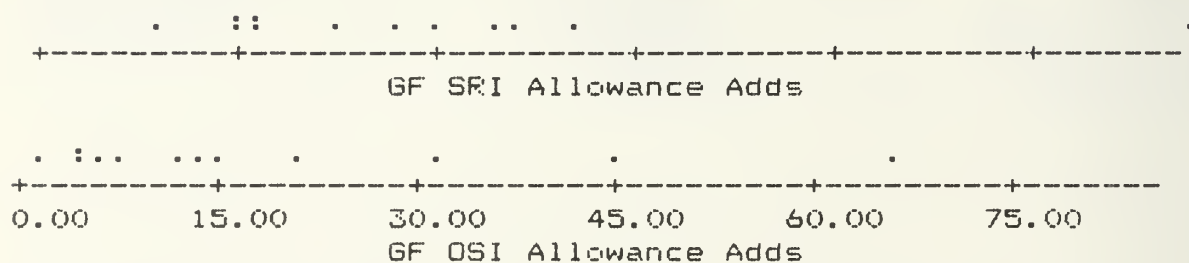


Figure 9. SSBN-726 GF SRI vs GF OSI ISNSL Allowance Additions Dotplot

TABLE 23

SSBN-726 GF SRI VS GF OSI ISNSL ALLOWANCE ADDITIONS T TEST
AND ANALYSIS OF VARIANCE

T Test for GF SRI Adds vs CF SRI Adds

	N	MEAN	STDEV	SE MEAN
GF SRI	12	24.6	20.6	5.9
CF SRI	12	20.6	19.7	5.7

95 PCT CI FOR MU GF SRI Adds - MU GF OSI Adds: (-13.1, 21.1)
TTEST MU GF SRI Adds = MU GF OSI Adds (VS NE): T=0.49 F=0.63
DF=22.0

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	97	97	0.24
ERROR	22	8924	406	
TOTAL	23	9021		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	-----+-----+-----+-----
GF SRI	12	24.64	20.61	(-----*-----)
GF OSI	12	20.62	19.66	(-----*-----)
-----+-----+-----+-----				
POOLED STDEV =		20.14		16.0 24.0 32.0

TABLE 24

SSBN-726 CF SRI AND CF OSI ISNSL ALLOWANCE ADDITIONS

Hull	ISNSL	CF/SRI	CF/SRI	CF/SRI	CF/OSI	CF/OSI	CF/OSI
		Allw	Adds	Adds %	Allw	Adds	Adds %
727	2	6893	1088	15.7841	489	94	19.2229
727	3	7040	523	7.4290	456	21	4.6053
727	4	7200	761	10.5694	377	6	1.5915
727	5	6944	886	12.7592	400	93	22.2500
727	6	7117	755	10.6084	500	117	23.4000
729	2	6353	900	14.1665	633	164	25.9084
729	3	7225	1392	19.2664	935	368	39.3583
730	2	6385	454	7.1104	683	174	25.4758
730	3	7207	1778	24.6705	938	366	39.0192
731	2	7119	693	9.7345	927	233	25.1348
731	3	7193	977	13.5826	935	302	32.2995
733	2	6996	1953	27.9159	1004	162	16.1355

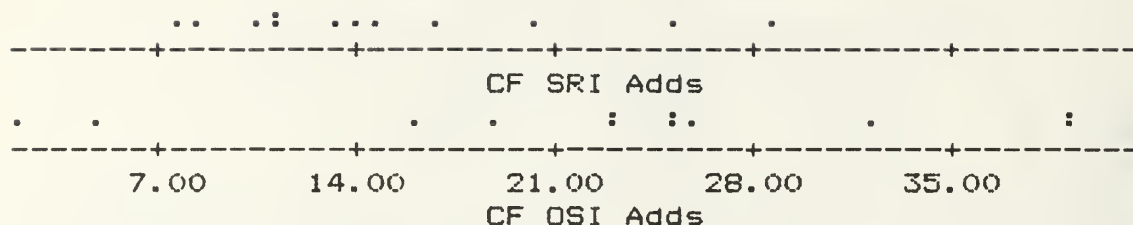


Figure 10. SSBN-726 CF SRI vs CF OSI ISNSL Allowance Additions Dotplot

TABLE 25
SSBN-726 CF SRI VS CF OSI ISNSL ALLOWANCE ADDITIONS
T TEST AND ANALYSIS OF VARIANCE

T Test for CF SRI Adds vs CF OSI Adds

	N	MEAN	STDEV	SE MEAN
CF SRI	12	14.47	6.53	1.9
CF OSI	12	23.0	11.6	3.4

95 PCT CI FOR MU CF SRI - MU CF OSI: (-16.6, -0.4)

TTEST MU CF SRI = MU CF OSI (VS NE): T=-2.20 F=0.042 DF=17.3

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	431.8	431.8	4.85
ERROR	22	1957.8	89.0	
TOTAL	23	2389.6		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
CF SRI	12	14.466	6.534	(-----*-----)
CF OSI	12	22.950	11.631	(-----*-----)
POOLED STDEV = 9.433				12.0 18.0 24.0 30.0

TABLE 26
SSBN-726 GF AND CF SRI ISNSL ALLOWANCE ADDITION PERCENTAGES

Hull	ISNSL	GF SRI Adds %	CF SRI Adds %
727	2	31.4884	15.7841
727	3	12.3349	7.4290
727	4	10.3161	10.5694
727	5	18.5143	12.7592
727	6	26.0231	10.6084
729	2	22.3916	14.1665
729	3	10.3248	19.2664
730	2	35.3067	7.1104
730	3	30.1682	24.6705
731	2	4.2674	9.7345
731	3	12.3750	13.5826
733	2	82.1747	27.9159

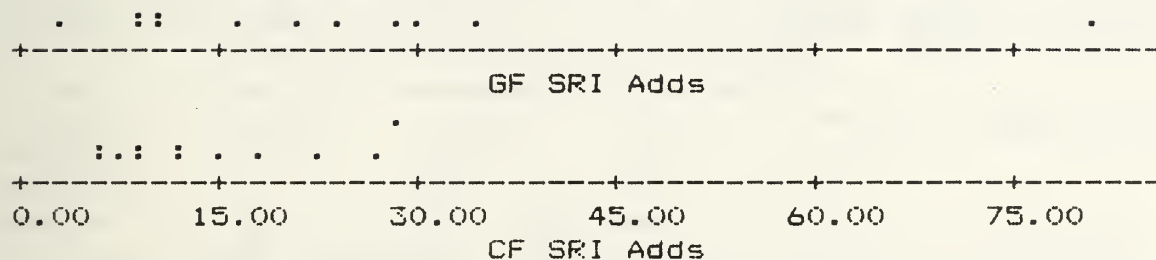


Figure 11. SSBN-726 GF SRI vs CF SRI ISNSL Allowance Additions Dotplot

TABLE 27
SSBN-726 GF SRI vs CF SRI ISNSL ALLOWANCE ADDITIONS
T TEST AND ANALYSIS OF VARIANCE

T Test for GF SRI Adds vs CF SRI Adds

	N	MEAN	STDEV	SE MEAN
GF SRI	12	24.6	20.6	5.9
CF SRI	12	14.47	6.53	1.9

95 PCT CI FOR MU GF SRI Adds - MU CF SRI Adds: (-3.3, 23.7)
TTEST MU GF SRI Adds = MU CF SRI Adds (VS NE): T=1.63 P=0.13
DF=13.2

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	621	621	2.66
ERROR	22	5143	234	
TOTAL	23	5764		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI	12	24.64	20.61	(-----*-----)
CF SRI	12	14.47	6.53	(-----*-----)
POOLED STDEV = 15.29				8.0 16.0 24.0 32.0

TABLE 28
SSBN-726 GF OSI AND CF OSI ISNSL ALLOWANCE ADDITION
PERCENTAGES

	Hull	ISNSL	GF OSI Adds %	CF OSI Adds %
	727	2	22.4138	19.2229
	727	3	2.3256	4.6053
	727	4	7.9519	1.5915
	727	5	14.9011	23.2500
	727	6	17.1318	23.4000
	729	2	13.9737	25.9084
	729	3	5.7580	39.3583
	730	2	46.5283	25.4758
	730	3	33.5182	39.0192
	731	2	5.4368	25.1348
	731	3	9.4610	32.2995
	733	2	68.0586	16.1355

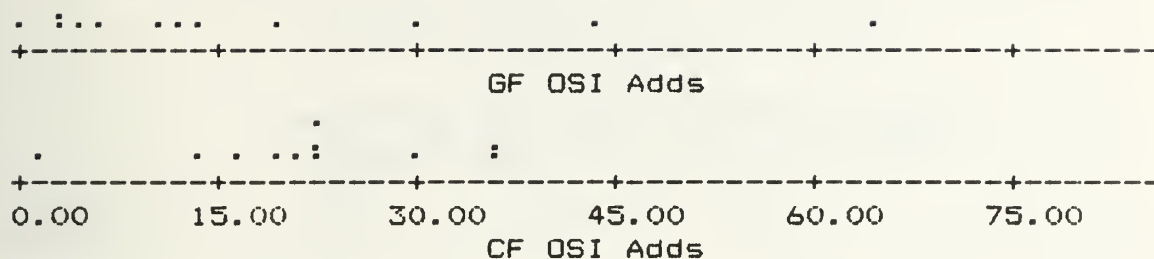


Figure 12. SSBN-726 GF OSI vs CF OSI ISNSL Allowance Additions Dotplot

T Test for GF OSI Adds vs CF OSI Adds

	N	MEAN	STDEV	SE MEAN
GF OSI	12	20.6	19.7	5.7
CF OSI	12	23.0	11.6	3.4

95 PCT CI FOR MU GF OSI - MU CF OSI: (-16.2, 11.6)

TTEST MU GF OSI = MU CF OSI (VS NE): T=-0.35 P=0.73 DF=17.9

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	33	33	0.12
ERROR	22	5739	261	
TOTAL	23	5772		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF OSI	12	20.62	19.66	(-----*-----)
CF OSI	12	22.95	11.63	(-----*-----)
FOOLED STDEV = 16.15				12.0 18.0 24.0 30.0

TABLE 29

SSBN-726 GF OSI VS GF OSI ISNSL ALLOWANCE ADDITIONS
T TEST AND ANALYSIS OF VARIANCE

APPENDIX C

SSBN-726 ISNSL ALLOWANCE ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE

TABLE 30
SSBN-726 GF ISNSL ALLOWANCE ADDITIONS
ANNUAL BRF UPDATE A FACTOR

Hull	ISNSL	GF SRI Allw	GF SRI Adds	GF SRI Adds %	GF OSI Allw	GF OSI Adds	GF OSI Adds %
727	2	4535	1428	31.4884	2209	494	22.3631
727	5	3527	653	18.5143	2275	339	14.9011
729	2	4265	955	22.3916	3113	435	13.9737
730	3	4339	1309	30.1682	3246	1088	33.5182
731	3	4299	532	12.3750	2653	251	9.4610
733	2	4258	3499	82.1747	3209	2184	68.0586

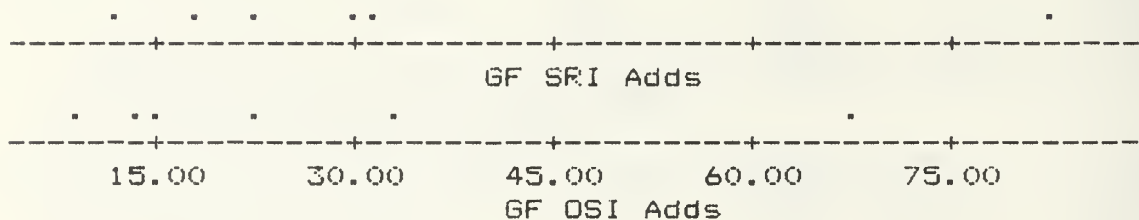


Figure 13. SSBN-726 ISNSL GF SRI vs OSI Allowance Additions
Dotplot Annual BRF Update a Factor

TABLE 31
SSBN-726 GF SRI VS GF OSI ISNSL ALLOWANCE ADDITIONS
ANNUAL BRF UPDATE A FACTOR
T TEST AND ANALYSIS OF VARIANCE

T Test for GF SRI VS GF OSI

	N	MEAN	STDEV	SE MEAN
GF SRI	6	32.9	25.2	10
GF OSI	6	27.0	21.8	8.9

95 PCT CI FOR MU GF SRI - MU GF OSI: (-25, 36.6)

TTEST MU GF SRI = MU GF OSI (VS NE): T=0.43 P=0.68 DF=9.8

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	101	101	0.18
ERROR	10	5550	555	
TOTAL	11	5651		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI	6	32.85	25.20	(-----*-----)
GF OSI	6	27.05	21.79	(-----*-----)
POOLED STDEV = 23.56				-----+-----+-----+-----+
				14 28 42 56

TABLE 32
SSBN-726 CF ISNSL ALLOWANCE ADDITIONS
ANNUAL BRF UPDATE A FACTOR

HULL	ISNSL	CF SRI Allw	CF SRI Adds	CF SRI Adds%	CF OSI Allw	CF OSI Adds	CF OSI Adds %
727	2	6893	1088	15.7841	489	94	19.2229
727	5	6944	886	12.7592	400	93	23.2500
729	2	6353	900	14.1665	633	164	25.9084
730	3	7207	1778	24.6705	938	366	39.0192
731	3	7193	977	13.5826	935	302	32.2995
733	2	6996	1953	27.9159	1004	162	16.1355

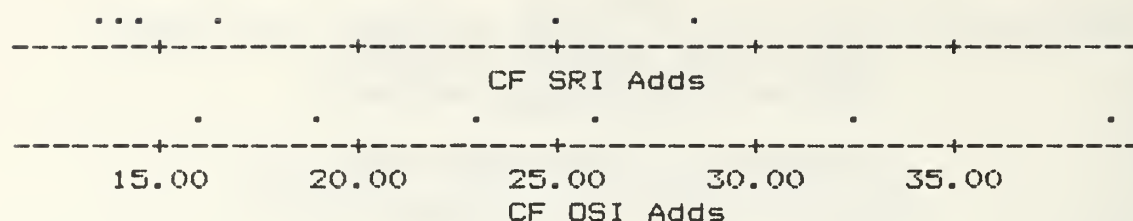


Figure 14. SSBN-726 CF SRI vs CF OSI ISNSL Allowance Additions Dotplot Annual BRF Update a Factor

TABLE 33
SSBN-726 CF SRI VS CF OSI ISNSL ALLOWANCE ADDITIONS
ANNUAL BRF UPDATING CONSIDERED A FACTOR
T TEST AND ANALYSIS OF VARIANCE

T Test for CF SRI VS CF OSI

	N	MEAN	STDEV	SE MEAN
CF SRI	6	18.15	6.47	2.6
CF OSI	6	25.97	8.49	3.5

95 PCT CI FOR MU CF SRI - MU CF OSI: (-17.7, 2.0)

TTEST MU CF SRI = MU CF OSI (VS NE): T=-1.80 P=0.11 DF=9.3

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	183.7	183.7	3.23
ERROR	10	569.3	56.9	
TOTAL	11	753.0		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
CF SRI	6	18.146	6.470	(-----*-----)
CF OSI	6	25.973	8.485	(-----*-----)
POOLED STDEV = 7.545				+-----+-----+-----+
				12.0 18.0 24.0 30.0

TABLE 34
SSBN-726 GF ISNSL ALLOWANCE ADDITIONS
ANNUAL BRF UPDATE NOT A FACTOR

Hull	ISNSL	GF SRI Allw	GF SRI Adds	GF SRI Adds %	GF OSI Allw	GF OSI Adds	GF OSI Adds %
727	3	3332	411	12.3349	2193	51	2.3256
727	4	3480	359	10.3161	2163	172	7.9519
727	6	3885	1011	26.0231	2580	442	17.1318
729	3	4310	445	10.3248	3074	177	5.7580
730	2	3733	1318	35.3067	2650	1233	46.5283
731	2	4054	173	4.2674	3182	173	5.4368

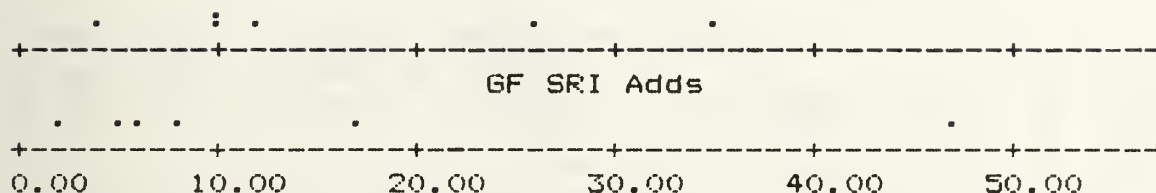


Figure 15. SSBN-726 GF ISNSL Allowance Additions Dotplot
Annual BRF Update a Not Factor

TABLE 35
SSBN-726 GF SRI VS GF OSI ISNSL ALLOWANCE ADDITIONS
ANNUAL BRF UPDATE NOT A FACTOR
T TEST AND ANALYSIS OF VARIANCE

T Test for GF SRI VS GF OSI

	N	MEAN	STDEV	SE MEAN
GF SRI	6	16.4	11.7	4.8
GF OSI	6	14.2	16.6	6.8

95 PCT CI FOR MU GF SRI - MU GF OSI: (-16.9, 21.4)
TTEST MU GF SRI = MU GF OSI (VS NE): T=0.27 P=0.79 DF=9.0

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	15	15	0.07
ERROR	10	2070	207	
TOTAL	11	2085		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	-----+-----+-----+-----
GF SRI	6	16.43	11.73	(-----*-----)
GF OSI	6	14.19	16.62	(-----*-----)
				-----+-----+-----+-----
POOLED STDEV =		14.39		8.0 16.0 24.0

TABLE 36
SSBN-726 CF ISNSL ALLOWANCE ADDITIONS
ANNUAL BRF UPDATE NOT A FACTOR

HULL	ISNSL	CF SRI Allw	CF SRI Adds	CF SRI Adds %	CF OSI Allw	CF OSI Adds	CF OSI Adds %
727	3	7040	523	7.4290	456	21	4.6053
727	4	7200	761	10.5694	377	6	1.5915
727	6	7117	755	10.6084	500	117	23.4000
729	3	7225	1392	19.2664	935	368	39.3583
730	2	6385	454	7.1104	683	174	25.4758
731	2	7119	693	9.7345	927	233	25.1348

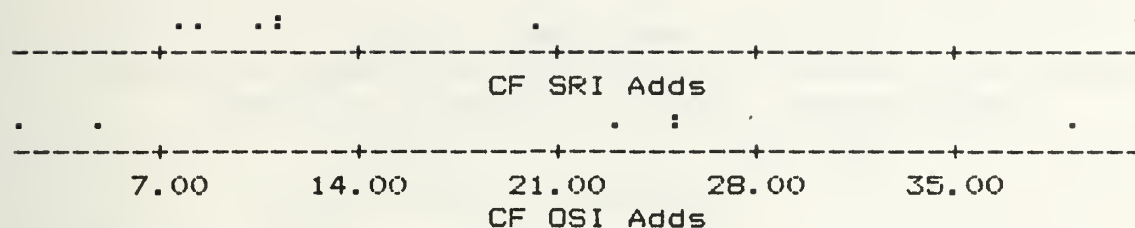


Figure 16. SSBN-726 CF SRI vs CF OSI ISNSL Allowance Additions Dotplot Annual BRF Update a Not Factor

TABLE 37
SSBN-726 CF SRI VS CF OSI ISNSL ALLOWANCE ADDITIONS
ANNUAL BRF UPDATE NOT A FACTOR
T TEST AND ANALYSIS OF VARIANCE

T Test for CF SRI VS CF OSI

	N	MEAN	STDEV	SE MEAN
CF SRI	6	10.79	4.42	1.8
CF OSI	6	19.9	14.3	5.8

95 PCT CI FOR MU CF SRI - MU CF OSI: (-24.8, 6.5)

TTEST MU CF SRI = MU CF OSI (VS NE): T=-1.50 P=0.19 DF=6.0

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	251	251	2.25
ERROR	10	1116	112	
TOTAL	11	1367		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
CF SRI	6	10.79	4.42	(-----*-----)
CF OSI	6	19.93	14.27	(-----*-----)
POOLED STDEV = 10.57				-----+-----+-----+-----
				8.0 16.0 24.0

TABLE 38
SSBN-726 GF SRI AND CF SRI ISNSL ALLOWANCE ADDITIONS
PERCENTAGES - ANNUAL BRF UPDATE A FACTOR

	HULL ISNSL	GF SRI Addds %	CF SRI Addds %
727	2	31.4884	15.7841
727	5	18.5143	12.7592
729	2	22.3916	14.1665
730	3	30.1682	24.6705
731	3	12.3750	13.5826
733	2	82.1747	27.9159

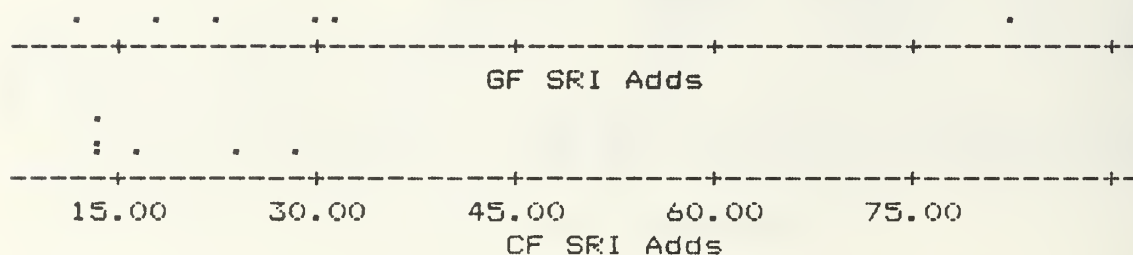


Figure 17. SSBN-726 GF SRI vs CF SRI ISNSL Allowance Additions Dotplot Annual BRF Update a Factor

TABLE 39
SSBN-726 GF SRI VS CF SRI ISNSL ALLOWANCE ADDITIONS
ANNUAL BRF UPDATE A FACTOR
T TEST AND ANALYSIS OF VARIANCE

T Test for GF SRI VS CF SRI

	N	MEAN	STDEV	SE MEAN
GF SRI	6	32.9	25.2	10
CF SRI	6	18.15	6.47	2.6

95 PCT CI FOR MU GF SRI - MU CF SRI: (-13, 42.0)
TTEST MU GF SRI = MU CF SRI (VS NE): T=1.38 P=0.22 DF=5.7

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	649	649	1.92
ERROR	10	3385	339	
TOTAL	11	4034		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI	6	32.85	25.20	(-----+-----+-----+-----)
CF SRI	6	18.15	6.47	(-----*-----)

POOLED STDEV = 18.40

14 28 42

TABLE 40
SSBN-726 GF OSI AND CF OSI ISNSL ALLOWANCE ADDITIONS
PERCENTAGES - ANNUAL BRF UPDATE A FACTOR

	HULL ISNSL	GF OSI Addds %	CF OSI Addds %
727	2	22.3631	19.2229
727	5	14.9011	23.2500
729	2	13.9737	25.9084
730	3	33.5182	39.0192
731	3	9.4610	32.2995
733	2	68.0586	16.1355

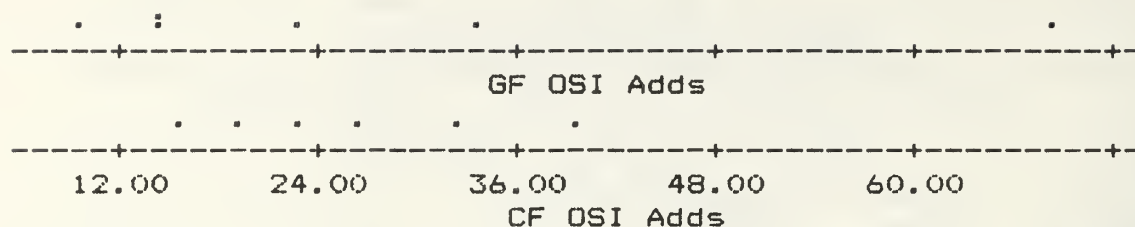


Figure 18. SSBN-726 GF OSI vs CF OSI ISNSL Allowance Additions Dotplot Annual BRF Update a Factor

TABLE 41
SSBN-726 GF OSI VS CF OSI ISNSL ALLOWANCE ADDITIONS
ANNUAL BRF UPDATE A FACTOR
T TEST AND ANALYSIS OF VARIANCE

T Test for GF OSI VS CF OSI

	N	MEAN	STDEV	SE MEAN
GF OSI	6	27.0	21.8	8.9
CF OSI	6	25.97	8.49	3.5

95 PCT CI FOR MU GF OSI - MU CF OSI: (-22.3, 24.4)

TTEST MU GF OSI = MU CF OSI (VS NE): T=0.11 P=0.91 DF=6.5

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	3	3	0.01
ERROR	10	2733	273	
TOTAL	11	2737		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF OSI	6	27.05	21.79	(-----*-----)
CF OSI	6	25.97	8.49	(-----*-----)
POOLED STDEV = 16.53				20 30 40

TABLE 42
SSBN-726 GF SRI AND CF SRI ISNSL ALLOWANCE ADDITIONS
PERCENTAGES - ANNUAL BRF UPDATE NOT A FACTOR

HULL	ISNSL	GF SRI Addds %	CF SRI Addds %
727	3	12.3349	7.4290
727	4	10.3161	10.5694
727	6	26.0231	10.6084
729	3	10.3248	19.2664
730	2	35.3067	7.1104
731	2	4.2674	9.7345

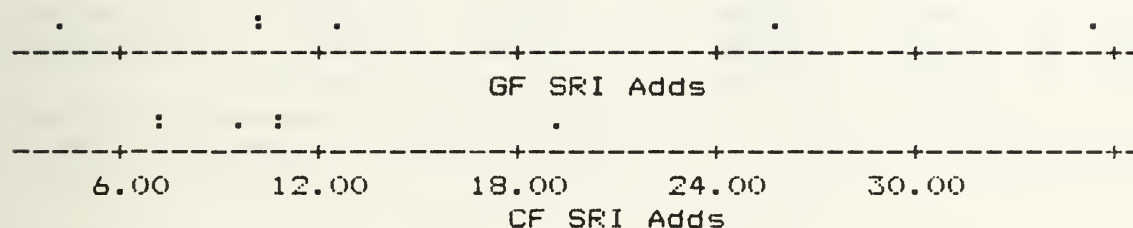


Figure 19. SSBN-726 GF SRI vs CF SRI ISNSL Allowance Additions Dotplot Annual BRF Update Not a Factor

TABLE 43
SSBN-726 GF OSI VS CF SRI ISNSL ALLOWANCE ADDITIONS
ANNUAL BRF UPDATE NOT A FACTOR
T TEST AND ANALYSIS OF VARIANCE

T Test for GF SRI VS CF SRI

	N	MEAN	STDEV	SE MEAN
GF SRI	6	16.4	11.7	4.8
CF SRI	6	10.79	4.42	1.8

95 PCT CI FOR MU GF SRI - MU CF SRI: (-6.9, 18.2)

TTEST MU GF SRI = MU CF SRI (VS NE): T=1.10 P=0.31 DF=6.4

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	95.5	95.5	1.22
ERROR	10	785.6	78.6	
TOTAL	11	881.1		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI	6	16.429	11.728	(-----*-----)
CF SRI	6	10.786	4.425	(-----*-----)

POOLED STDEV = 8.863 6.0 12.0 18.0 24.0

TABLE 44
SSBN-726 GF OSI AND CF OSI ISNSL ALLOWANCE ADDITIONS
PERCENTAGES - ANNUAL BRF UPDATE NOT A FACTOR

HULL	ISNSL	GF OSI Adds %	CF OSI Adds %
727	3	2.3256	4.6053
727	4	7.9519	1.5915
727	6	17.1318	23.4000
729	3	5.7580	39.3583
730	2	46.5283	25.4758
731	2	5.4368	25.1348

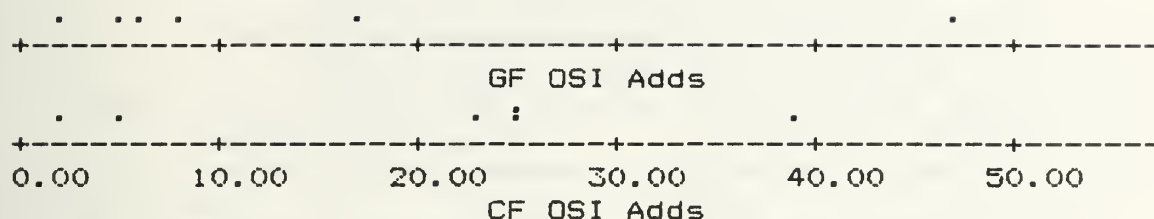


Figure 20. SSBN-726 GF OSI vs CF OSI and Allowance Additions Dotplot Annual BRf Update Not a Factor

TABLE 45
SSBN-726 GF OSI VS CF OSI ISNSL ALLOWANCE ADDITIONS
ANNUAL BRf UPDATE NOT A FACTOR
T TEST AND ANALYSIS OF VARIANCE

T Test for GF OSI VS CF OSI

	N	MEAN	STDEV	SE MEAN
GF OSI	6	14.2	16.6	6.8
CF OSI	6	19.9	14.3	5.8

95 PCT CI FOR MU GF OSI - MU CF OSI: (-26.0, 14.5)

TTEST MU GF OSI = MU CF OSI (VS NE): T=-0.64 F=0.54 DF=9.8

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	99	99	0.41
ERROR	10	2400	240	
TOTAL	11	2499		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF OSI	6	14.19	16.62	(-----*-----)
CF OSI	6	19.93	14.27	(-----*-----)
POOLED STDEV = 15.49				10 20 30

TABLE 46
SSBN-726 GF SRI ISNSL ALLOWANCE ADDITIONS
STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update An ISNSL Factor			Annual BRF Update Not an ISNSL Factor		
HULL	ISNSL	GF SRI Adds %	HULL	ISNSL	GF SRI Adds %
727	2	31.4884	727	3	12.3349
727	5	18.5143	727	4	10.3161
729	2	22.3916	727	6	26.0231
730	3	30.1682	729	3	10.3248
731	3	12.3750	730	2	35.3067
733	2	82.1747	731	2	4.2674

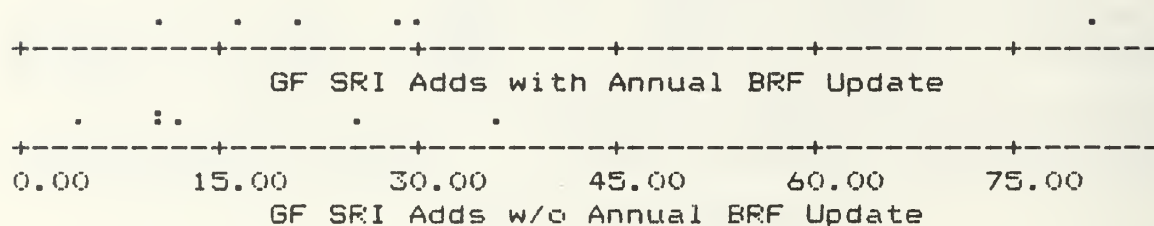


Figure 21. SSBN-726 GF SRI ISNSL Allowance Additions
Dotplot Stratified by Annual BRF Update

TABLE 47
SSBN-726 GF SRI ISNSL ALLOWANCE ADDITIONS
STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for GF SRI w/BRF Update VS GF SRI w/o BRF Update

	N	MEAN	STDEV	SE MEAN
GF SRI w/BRF	6	32.9	25.2	10
GF SRI w/o BRF	6	16.4	11.7	4.8

95 % CI FOR MU GF SRIw/BRF - MU GF SRI w/o BRF: (-10, 43.3)
TTEST MU GF SRIw/BRF = MU GF SRI w/o BRF (VS NE): T=1.45
P=0.19 DF=7.1

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	809	809	2.09
ERROR	10	3864	386	
TOTAL	11	4673		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI w/BRF	6	32.85	25.20	(-----*-----)
GF SRI w/o BRF	6	16.43	11.73	(-----*-----)
POOLED STDEV = 19.66				0 16 32 48

TABLE 48
SSBN-726 GF OSI ISNSL ALLOWANCE ADDITIONS
STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update An ISNSL Factor			Annual BRF Update Not an ISNSL Factor		
HULL	ISNSL	GF OSI Add %	HULL	ISNSL	GF OSI Add %
727	2	22.3631	726	3	2.3256
727	5	14.9011	726	4	7.9519
729	2	13.9737	726	6	17.1318
730	3	33.5182	729	3	5.7580
731	3	9.4610	730	2	46.5283
733	2	68.0586	731	2	5.4368

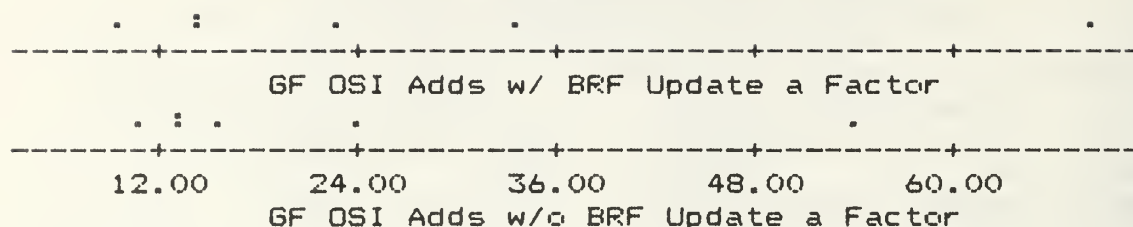


Figure 22. SSBN-726 GF OSI ISNSL Allowance Additions
Dotplot Stratified by Annual BRF Update

TABLE 49
SSBN-726 ISNSL GF OSI ISNSL ALLOWANCE ADDITIONS
STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for GF OSI w/BRF Update VS GF OSI w/o BRF Update

	N	MEAN	STDEV	SE MEAN
GF OSI w/BRF	6	27.0	21.8	8.9
GF OSI w/o BRF	6	14.2	16.6	6.8

95 % CI FOR MU GF OSI w/BRF - MU GF OSI w/oBRF: (-12.5, 38.2)
TTEST MU GF OSI w/BRF = MU GF OSI w/o BRF (VS NE): T=1.15
P=0.28 DF=9.3

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	496	496	1.32
ERROR	10	3755	376	
TOTAL	11	4251		

INDIVIDUAL 95 PCT CI'S FOR MEAN BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF OSI w/BRF	6	27.05	21.79	(-----*-----)
GF OSI w/o BRF	6	14.19	16.62	(-----*-----)
POOLED STDEV = 19.38				0 14 28 42

TABLE 50
SSBN-726 CF SRI ISNSL ALLOWANCE ADDITIONS
STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update An ISNSL Factor			Annual BRF Update Not an ISNSL Factor		
HULL	ISNSL	CF SRI Adds %	HULL	ISNSL	CF SRI Adds %
727	2	15.7841	726	3	7.4290
727	5	12.7592	726	4	10.5694
729	2	14.1665	726	6	10.6084
730	3	24.6705	729	3	19.2664
731	3	13.5826	730	2	7.1104
733	2	27.9159	731	2	9.7345

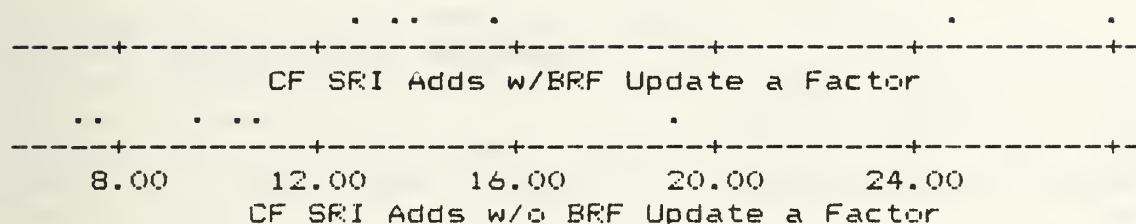


Figure 23. SSBN-726 CF SRI ISNSL Allowance Additions
Dotplot Stratified by an Annual BRF Update

TABLE 51
SSBN-726 CF SRI ISNSL ALLOWANCE ADDITIONS
STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for CF SRIw/ BRF Update VS CF SRI w/o BRF Update

	N	MEAN	STDEV	SE MEAN
CF SRI w/BRF	6	18.15	6.47	2.6
CF SRI w/o BRF	6	10.79	4.42	1.8

95 % CI FOR MU CF SRIw/BRF - MU CF SRI w/o BRF: (-0.0, 14.7)
TTEST MU CF SRI w/BRF = MU CF SRI w/o BRF (VS NE): T=2.30
P=0.050 DF=8.8

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	162.5	162.5	5.29
ERROR	10	307.2	30.7	
TOTAL	11	469.7		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
CF SRI w/BRF	6	18.146	6.470	(-----+-----+-----+-----)
CF SRI w/o BRF	6	10.786	4.425	(-----*-----)
POOLED STDEV = 5.542				-----+-----+-----+-----
				10.0 15.0 20.0

TABLE 52
SSBN-726 CF OSI ISNSL ALLOWANCE ADDITIONS
STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update An ISNSL Factor			Annual BRF Update Not an ISNSL Factor		
HULL	ISNSL	CF OSI Adds %	HULL	ISNSL	CF OSI Adds %
727	2	19.2229	726	3	4.6053
727	5	23.2500	726	4	1.5915
729	2	25.9084	726	6	23.4000
730	3	39.0192	729	3	39.3583
731	3	32.2995	730	2	25.4758
733	2	16.1355	731	2	25.1348

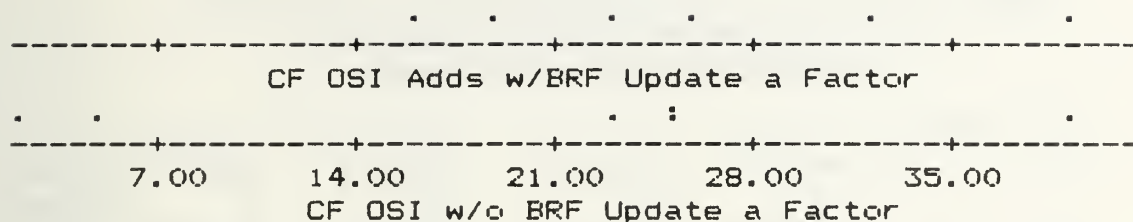


Figure 24. SSBN-726 CF OSI ISNSL Allowance Additions
Dotplot Stratified by Annual BRF Update

TABLE 53
SSBN-726 CF OSI ISNSL ALLOWANCE ADDITIONS
STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for CF OSI w/BRF Update VS CF OSI w/o BRF Update

	N	MEAN	STDEV	SE MEAN
CF OSI w/BRF	6	25.97	8.49	3.5
CF OSI w/o BRF	6	19.9	14.3	5.8

95 % CI FOR MU CF OSIw/BRF - MU CF OSI w/o BRF: (-9.6, 21.7)
TTEST MU CF OSI w/BRF = MU CF OSI w/o BRF (VS NE): T=0.89
P=0.40 DF=8.1

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	110	110	0.80
ERROR	10	1378	138	
TOTAL	11	1488		

INDIVIDUAL 95 PCT CI'S FOR MEAN BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
CF OSI w/BRF	6	25.97	8.49	(-----*-----)
CF OSI w/o BRF	6	19.93	14.27	(-----*-----)
POOLED STDEV = 11.74				-----+-----+-----+-----
				15.0 22.5 30.0

TABLE 54
SSBN-726 ISNSL ALLOWANCE ADDITION PERCENTAGES
BY SUPPLIER AND STORAGE LOCATION
ANNUAL BRF UPDATE A FACTOR

HULL	ISNSL	GF SRI Adds %	GF OSI Adds %	CF SRI Adds %	CF OSI Adds %
727	2	31.4884	22.3631	15.7841	19.2229
727	5	18.5143	14.9011	12.7592	23.2500
729	2	22.3916	13.9737	14.1665	25.9084
730	3	30.1682	33.5182	24.6705	39.0192
731	3	12.3750	9.4610	13.5826	32.2995
733	2	82.1747	68.0586	27.9159	16.1355

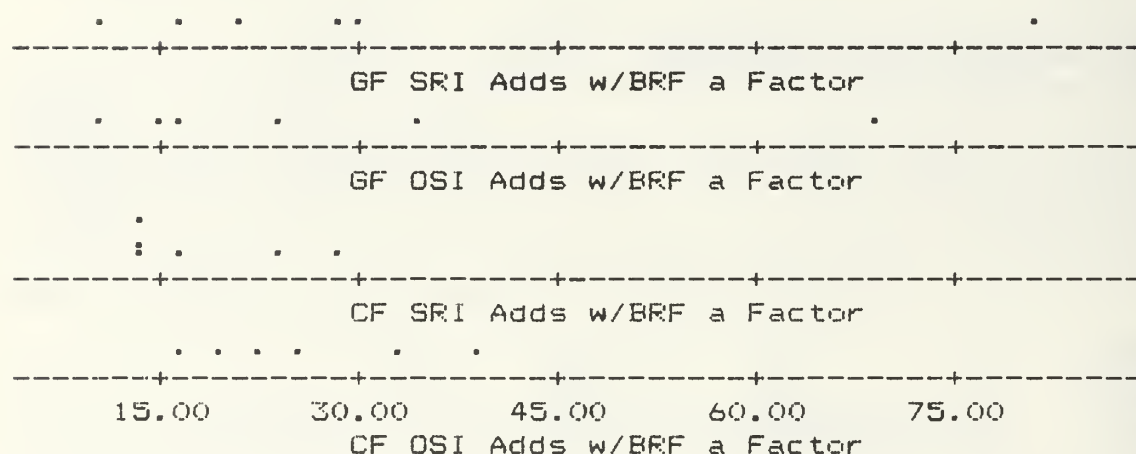


Figure 25. SSBN-726 ISNSL Allowance Additions Dotplot
Annual BRF Update a Factor

TABLE 55
SSBN-726 ISNSL ALLOWANCE ADDITIONS
ANALYSIS OF VARIANCE
ANNUAL BRF UPDATE A FACTOR

SOURCE	DF	SS	MS	F
FACTOR	3	658	219	0.72
ERROR	20	6119	306	
TOTAL	23	6777		

				INDIVIDUAL 95 PCT CI'S FOR MEAN BASED ON POOLED STDEV			
LEVEL	N	MEAN	STDEV	-----+-----+-----+-----			
GF SRI	6	32.85	25.20		(-----*-----)		
GF OSI	6	27.05	21.79		(-----*-----)		
CF SRI	6	18.15	6.47	(-----*-----)			
CF OSI	6	25.97	8.49		(-----*-----)		
POOLED STDEV = 17.49				-----+-----+-----+-----			
				14	28	42	

TABLE 56
SSBN-726 ISNSL ALLOWANCE ADDITION PERCENTAGES
BY SUPPLIER AND STORAGE LOCATION
ANNUAL BRF UPDATE NOT A FACTOR

HULL	ISNSL	GF SRI Add's %	GF OSI Add's %	CF SRI Add's %	CF OSI Add's %
727	3	12.3349	2.3256	7.4290	4.6053
727	4	10.3161	7.9519	10.5694	1.5915
727	6	26.0231	17.1318	10.6084	23.4000
729	3	10.3248	5.7580	19.2664	39.3583
730	2	35.3067	46.5283	7.1104	25.4758
731	2	4.2674	5.4368	9.7345	25.1348

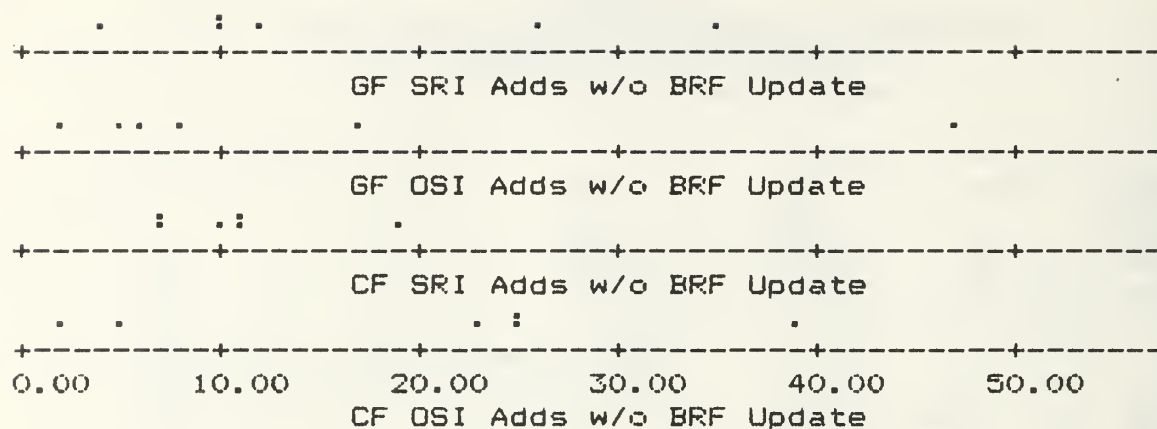


Figure 26. SSBN-726 ISNSL Allowance Additions Dotplot
Annual BRF Update Not a Factor

TABLE 57
SSBN-726 ISNSL ALLOWANCE ADDITIONS
ANALYSIS OF VARIANCE
ANNUAL BRF UPDATE NOT A FACTOR

SOURCE	DF	SS	MS	F
FACTOR	3	266	89	0.56
ERROR	20	3186	159	
TOTAL	23	3452		

				INDIVIDUAL 95 PCT CI'S FOR MEAN BASED ON POOLED STDEV	
LEVEL	N	MEAN	STDEV	-----+-----+-----+-----	
GF SRI	6	16.43	11.73	(-----*-----)	
GF OSI	6	14.19	16.62	(-----*-----)	
CF SRI	6	10.79	4.42	(-----*-----)	
CF OSI	6	19.93	14.27	(-----*-----)	
POOLED STDEV = 12.62				-----+-----+-----+-----	
				10	20 30

TABLE 58
SSBN-726 ISNSL ALLOWANCE ADDITIONS
ANALYSIS OF VARIANCE BY SUPPLIER,
STORAGE LOCATION AND AFFECT OF ANNUAL BRF UPDATE

SOURCE	DF	SS	MS	F
FACTOR	7	2291	327	1.41
ERROR	40	9305	233	
TOTAL	47	11595		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI	6	32.85	25.20	(-----*-----)
GF OSI	6	27.05	21.79	(-----*-----)
CF SRI	6	18.15	6.47	(-----*-----)
CF OSI	6	25.97	8.49	(-----*-----)
				-----+-----+-----+-----+
				0 14 28 42
Annual BRF Update a Factor				

GF SRI	6	16.43	11.73	(-----*-----)
GF OSI	6	14.19	16.62	(-----*-----)
CF SRI	6	10.79	4.42	(-----*-----)
CF OSI	6	19.93	14.27	(-----*-----)
				-----+-----+-----+-----+
				0 14 28 42
Annual BRF Update Not a Factor				

POOLED STDEV = 15.2

APPENDIX D

SSBN-726 ISNSL ALLOWANCE DELETIONS

TABLE 59
SSBN-726 ISNSL ALLOWANCE DELETIONS

Hull	ISNSL	GF Allw	GF Del	GF % Del	CF Allw	CF Del	CF % Del
727	2	6744	1554	23.047	7382	1101	14.914
727	3	5525	1745	31.583	7496	713	9.511
727	4	5643	295	5.227	7577	323	4.262
727	5	5802	920	15.856	7344	1631	22.208
727	6	6465	682	10.549	7617	523	6.866
729	2	7383	1197	16.212	6986	997	14.271
729	3	7384	672	9.100	8160	393	4.816
730	2	6383	677	10.606	7068	1345	19.029
730	3	7585	947	12.485	8145	1037	12.731
731	2	7236	355	4.906	8046	680	8.451
731	3	6952	1198	17.232	8128	946	11.634
733	2	7456	239	3.205	8000	6706	83.825

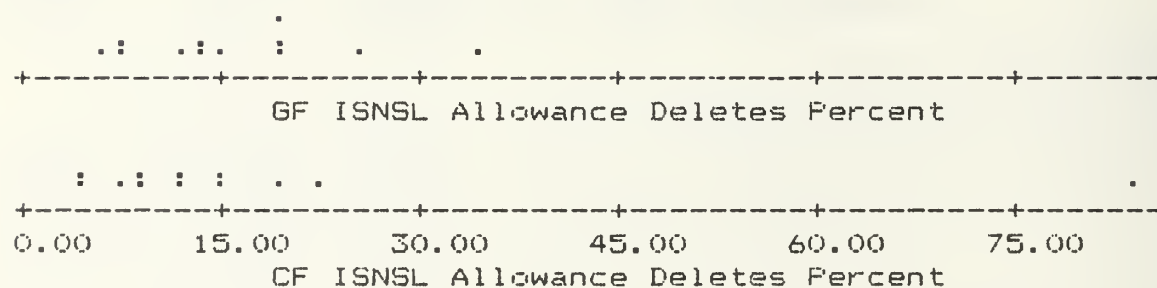


Figure 27. SSBN-726 GF vs GF ISNSL Allowance
Deletions Dotplot

TABLE 60
SSBN-726 GF VS CF ISNSL ALLOWANCE DELETIONS
T TEST AND ANALYSIS OF VARIANCE

T Test for GF Deletes VS CF Deletes

	N	MEAN	STDEV	SE MEAN
GF Deletes	12	13.33	8.15	2.4
CF Deletes	12	17.7	21.5	6.2

95 PCT CI FOR MU GF Deletes - MU CF Deletes: (-18.6, 9.9)
TTEST MU GF Deletes = MU CF Deletes (VS NE): T=-0.66 P=0.52
DF=14.1

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	115	115	0.43
ERROR	22	5822	265	
TOTAL	23	5937		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF Deletes	12	13.33	8.15	(-----*-----)
CF Deletes	12	17.71	21.52	(-----*-----)
				-----+-----+-----+-----
POOLED STDEV =		16.27		7.5 15.0 22.5

APPENDIX E

SSBN ISNSL ALLOWANCE DELETIONS STRATIFIED BY ANNUAL BRF UPDATE

TABLE 61
SSBN-726 CF AND GF ISNSL ALLOWANCE DELETIONS
ANNUAL BRF UPDATE A FACTOR

Hull	ISNSL	GF Allw	GF Del	GF % Del	CF Allw	CF Del	CF % Del
727	2	6744	1554	23.042	7382	1101	14.914
727	5	5802	920	15.856	7344	1631	22.208
729	2	7383	1197	16.212	6986	997	14.271
730	3	7585	947	12.485	8145	1037	12.731
731	3	6952	1198	17.232	8128	946	11.638
733	2	7467	239	3.200	8000	6706	83.825

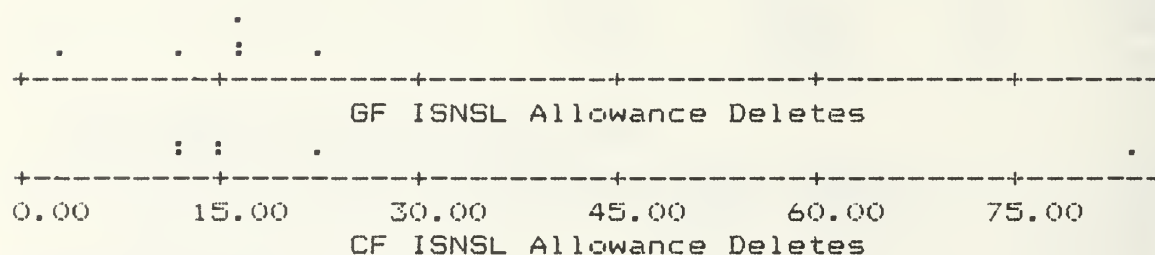


Figure 28. SSBN-726 GF vs CF ISNSL Allowance Deletions
Dotplot Annual BRF Update a Factor

TABLE 62
SSBN-726 GF vs CF ISNSL ALLOWANCE DELETIONS
ANNUAL BRF UPDATE A FACTOR
T TEST AND ANALYSIS OF VARIANCE

T Test for GF Deletes Percentage VS CF Deletes Percentage

	N	MEAN	STDEV	SE MEAN
GF Deletes %	6	14.67	6.58	2.7
CF Deletes %	6	26.6	28.3	12

95 PCT CI FOR MU GF Deletes % - MU CF Deletes %: (-42.4, 19)
TTEST MU GF Deletes % = MU CF Deletes % (VS NE): T=-1.01
P=0.36 DF=5.5

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	427	427	1.01
ERROR	10	4215	422	
TOTAL	11	4642		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF Del %	6	14.67	6.58	(-----*-----)
CF Del %	6	26.60	28.28	(-----*-----)
POOLED STDEV = 20.53				0 14 28 42

TABLE 63
SSBN-726 GF and CF ISNSL ALLOWANCE DELETIONS
ANNUAL BRF UPDATE NOT A FACTOR

Hull	ISNSL	GF Allw	GF Del	GF % Del	CF Allw	CF Del	CF % Del
727	3	5525	1745	31.583	7496	713	9.511
727	4	5643	295	5.227	7577	323	4.262
727	6	6465	682	10.549	7617	523	6.866
729	3	7384	672	9.100	8160	393	4.816
730	2	6383	677	10.606	7068	1345	19.029
731	2	7236	355	4.906	8046	680	8.451

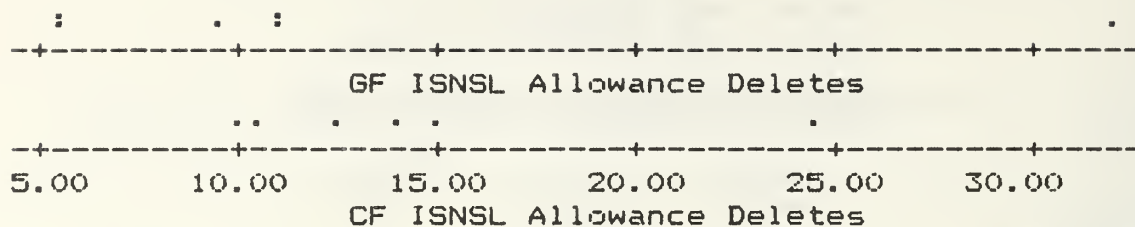


Figure 29. SSBN-726 GF vs CF ISNSL Allowance Deletions
Annual BRF Update Not a Factor

TABLE 64
SSBN-726 GF VS CF ISNSL ALLOWANCE DELETIONS
ANNUAL BRF UPDATE NOT A FACTOR
T TEST AND ANALYSIS OF VARIANCE

T Test for GF Deletes % VS CF Deletes %

	N	MEAN	STDEV	SE MEAN
GF Deletes %	6	12.00	9.92	4.1
CF Deletes %	6	8.82	5.39	2.2

95 % CI FOR MU GF Deletes % - MU CF Deletes %: (-7.7, 14.1)
TTEST MU GF Deletes % = MU CF Deletes % (VS NE): T=0.69
F=0.51 DF=7.7

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	30.2	30.2	0.47
ERROR	10	637.6	63.8	
TOTAL	11	667.8		

				INDIVIDUAL 95 PCT CI'S FOR MEAN BASED ON POOLED STDEV			
LEVEL	N	MEAN	STDEV	-----+-----+-----+-----			
GF Del %	6	11.996	9.921	(-----*-----)			
CF Del %	6	8.823	5.394	(-----*-----)			
				-----+-----+-----+-----			
POOLED STDEV =		7.985		5.0	10.0	15.0	

TABLE 65
SSBN-726 GF ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update A Factor			Annual BRF Update Not a Factor		
Hull	ISNSL	GF % Deletes	Hull	ISNSL	GF % Deletes
727	2	23.0427	727	3	31.5837
727	5	15.8566	727	4	5.2277
729	2	16.2129	727	6	10.5491
730	3	12.4852	729	3	9.1008
731	3	17.2324	730	2	10.6063
733	2	3.2007	731	2	4.9060

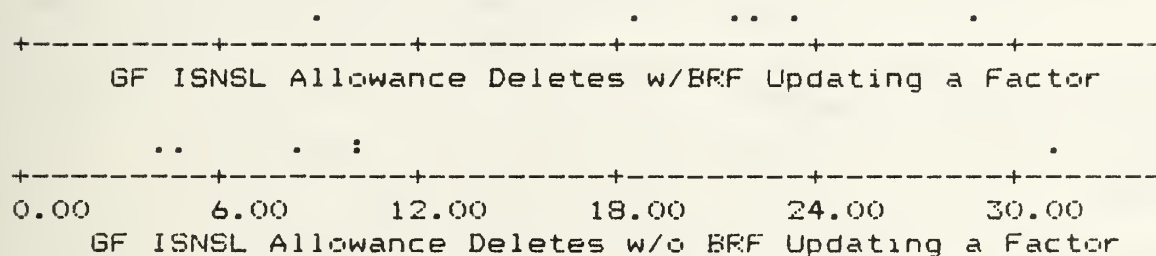


Figure 30. SSBN-726 ISNSL GF ISNSL Allowance Deletions
Dotplot Stratified by Annual BRF Update

TABLE 66
SSBN-726 GF ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for GF Deletes w/BRF Update VS GF Deletes w/o BRF Update

	N	MEAN	STDEV	SE MEAN
GF Deletes w/BRF	6	14.67	6.58	2.7
GF Deletes w/o BRF	6	12.00	9.92	4.1

95 PCT CI FOR MU GF Deletes w/BRF - MU GF Deletes w/o BRF:
(-8.5, 13.9)

TTEST MU GF Deletes w/BRF = MU GF Deletes w/o BRF (VS NE):
T=0.55 P=0.60 DF=8.7

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	21.5	21.5	0.30
ERROR	10	708.9	70.9	
TOTAL	11	730.4		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF Del w/BRF	6	14.672	6.584	(-----+-----+-----+-----)
GF Del w/o BRF	6	11.996	9.921	(-----+-----+-----+-----)

POOLED STDEV = 8.420 +-----+-----+-----+-----
5.0 10.0 15.0 20.0

TABLE 67
SSBN-726 CF ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update A Factor			Annual BRF Update Not a Factor		
Hull	ISNSL	CF % Deletes	Hull	ISNSL	CF % Deletes
727	2	14.9147	727	3	9.5117
727	5	22.2086	727	4	4.2629
729	2	14.2714	727	6	6.8662
730	3	12.7317	729	3	4.8162
731	3	11.6388	730	2	19.0294
733	2	83.8250	731	2	8.4514



Figure 31. SSBN-726 CF ISNSL Allowance Deletions
Stratified by Annual BRF Update

TABLE 68
SSBN-726 CF ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for CF Deletes % w/BRF VS CF Deletes % w/o BRF

	N	MEAN	STDEV	SE MEAN
CF Deletes w/BRF	6	26.6	28.3	12
CF Deletes w/o BRF	6	8.82	5.39	2.2

95 PCT CI FOR MU CF Deletes w/BRF - MU CF Deletes w/o BRF:
(-12, 48.0)

TTEST MU CF Deletes w/BRF = MU CF Deletes w/o BRF (VS NE):
T=1.51 P=0.19 DF=5.4

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	948	948	2.29
ERROR	10	4144	414	
TOTAL	11	5092		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	-----+-----+-----+-----
CF Del w/BRF	6	26.60	28.28	(-----*-----)
CF Del w/o BRF	6	8.82	5.39	(-----*-----)
POOLED STDEV =		20.36		-----+-----+-----+-----
				0 16 32

APPENDIX F

THIRD FLIGHT FFG-7 CORRELATION AND REGRESSION ANALYSIS

TABLE 69
THIRD FLIGHT FFG-7 REGRESSION AND
CORRELATION DATA

Hull	Independent Variable				Dependent Variables		
	ISNSL	Config Range	Config Depth	BRF Update	ISNSL Adds	ISNSL Deletes	Total Churn
40	4	223	1042	0	2661	2600	5261
41	3	557	3126	1	4710	4011	8721
41	4	49	250	0	2244	2074	4318
42	3	334	1950	1	3303	11174	14477
42	4	158	480	0	5349	1696	7045
43	2	1137	6410	1	7290	4751	12041
43	3	134	211	0	2632	2384	5016
43	4	21	251	1	4015	3641	7656
45	2	1002	5815	0	7925	3524	11449
45	3	223	487	1	3292	4040	7332
45	4	38	81	0	1815	1836	3651
46	2	1231	7024	1	7305	4931	12236
46	3	1005	347	0	2910	2542	5452
46	4	34	594	1	3042	3869	6911
47	2	1117	6144	1	8153	4080	12233
47	3	201	132	0	1306	2525	3831
47	4	7	265	1	3004	3227	6231
48	2	1323	10122	1	7807	4634	12441
48	3	302	3747	1	5002	4654	9656
48	4	77	1098	0	2922	2736	5658
49	2	1651	6146	1	8059	4442	12501
49	3	118	226	0	2666	2027	4693
49	4	2	62	1	3997	4034	8031

TABLE 70
THIRD FLIGHT FFG-7 CORRELATION TABLE

	Config Range	Config Depth	Adds	Deletes	Total Churn
Config Depth	0.937				
Adds	0.900	0.899			
Deletes	0.312	0.350	0.275		
Total Churn	0.786	0.808	0.832	0.762	
BRF Update	0.394	0.440	0.466	0.617	0.670

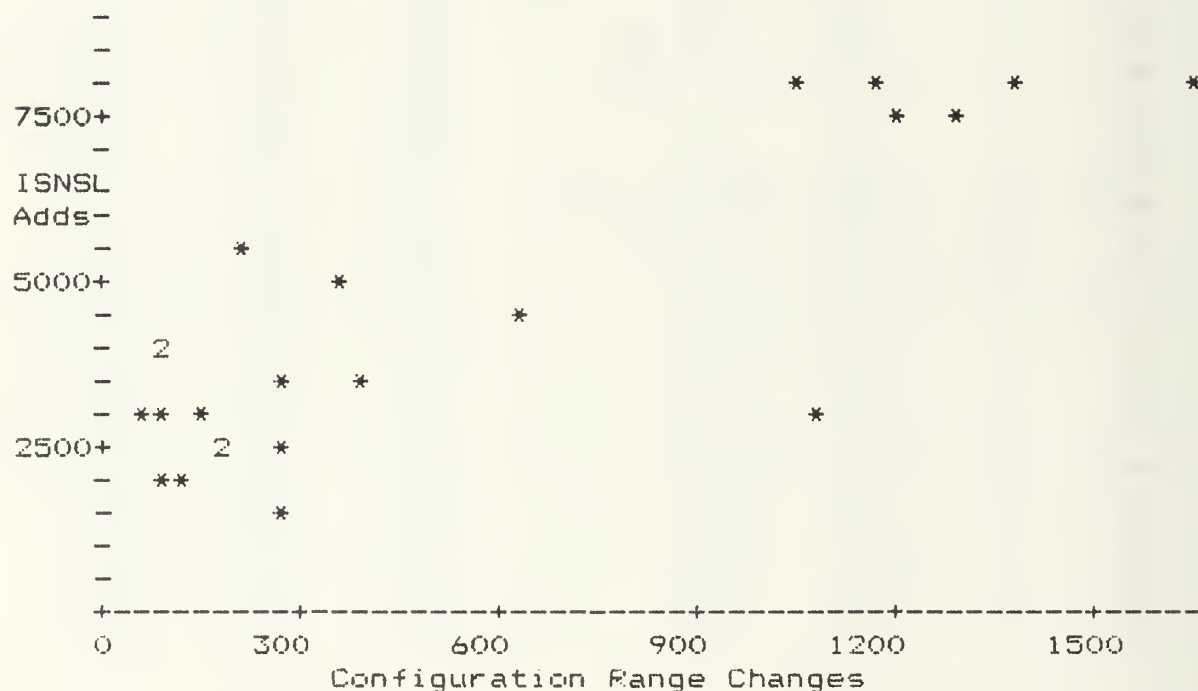


Figure 32. Third Flight FFG-7 ISNSL Date Scatterplot
Configuration Range Changes vs ISNSL Allowance Additions

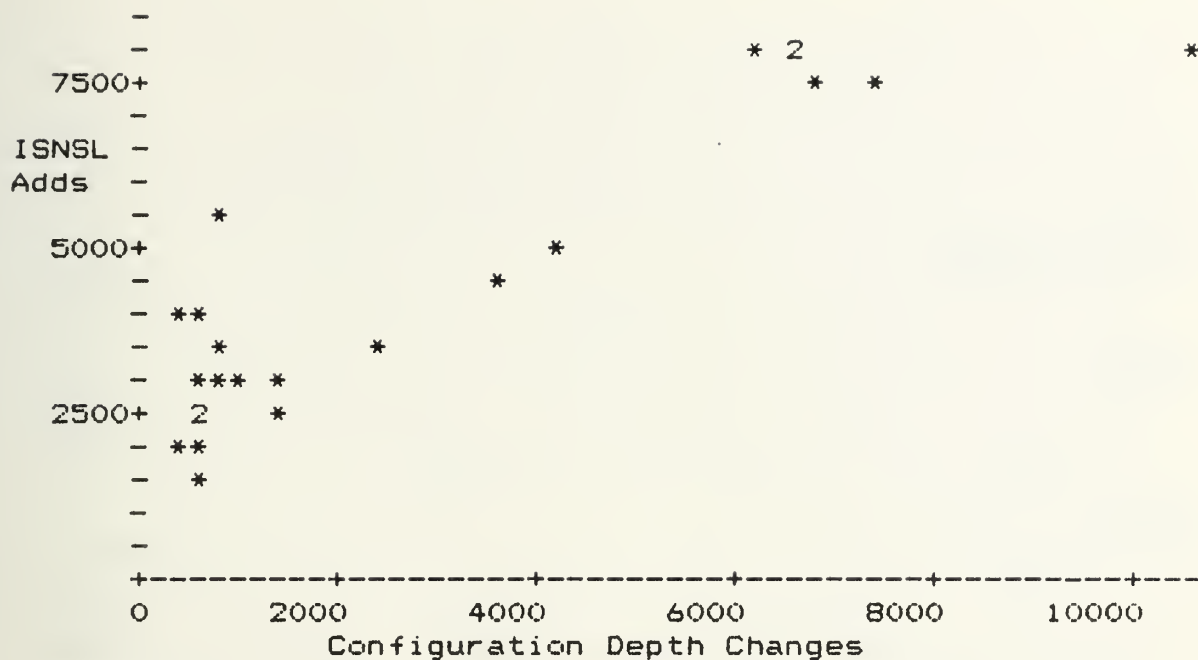


Figure 33. Third Flight FFG-7 ISNSL Data Scatterplot
Configuration Depth Changes vs ISNSL Allowance Additions

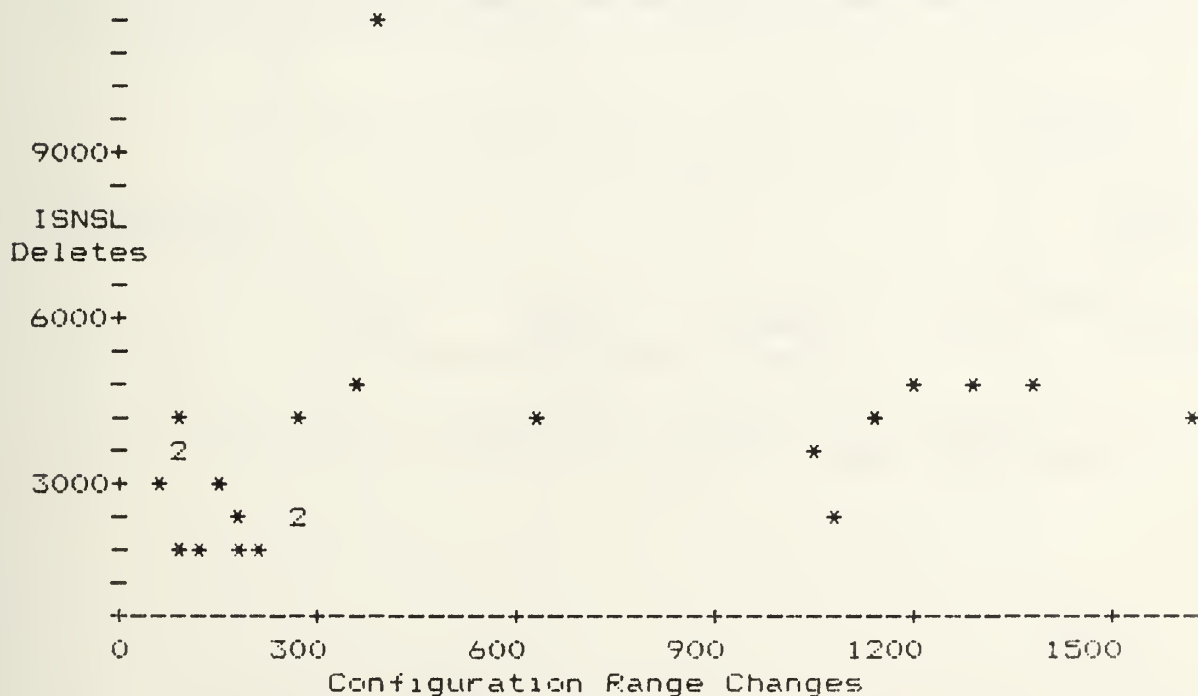


Figure 34. Third Flight FFG-7 ISNSL Data Scatterplot
Configuration Range Changes vs ISNSL Allowance Deletions

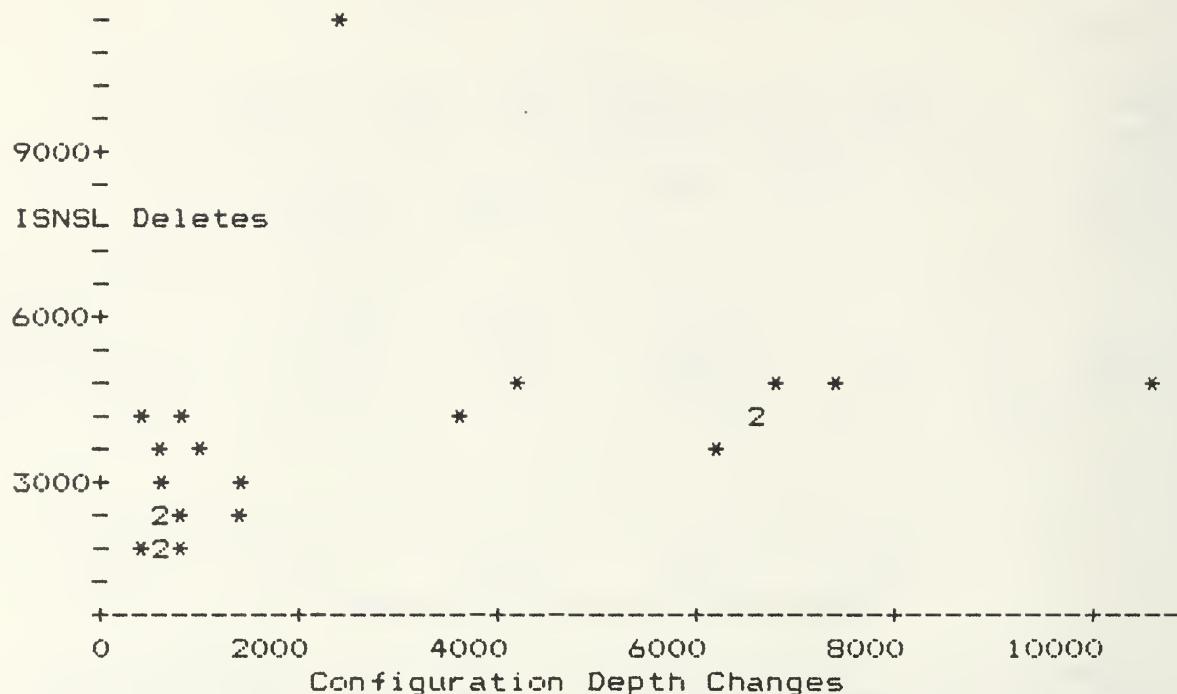


Figure 35. Third Flight FFG-7 ISNSL Data Scatterplot
Configuration Depth Changes vs ISNSL Allowance Deletions

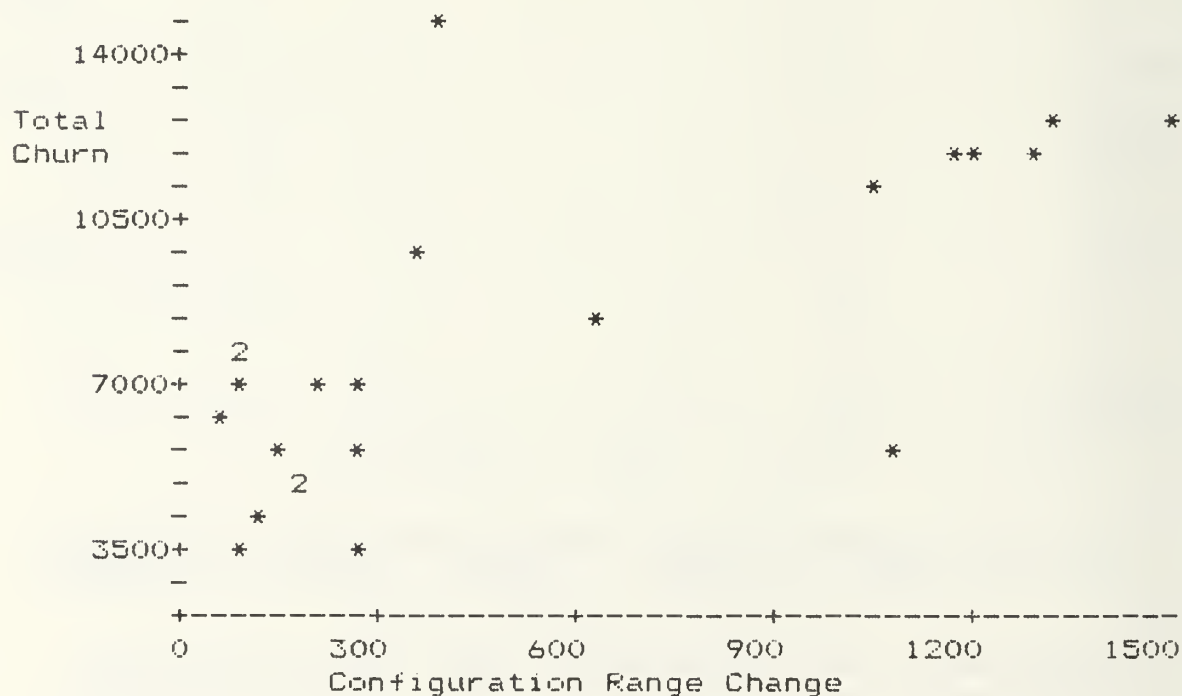


Figure 36. Third Flight FFG-7 ISNSL Data Scatterplot
Configuration Range Changes vs Total Churn

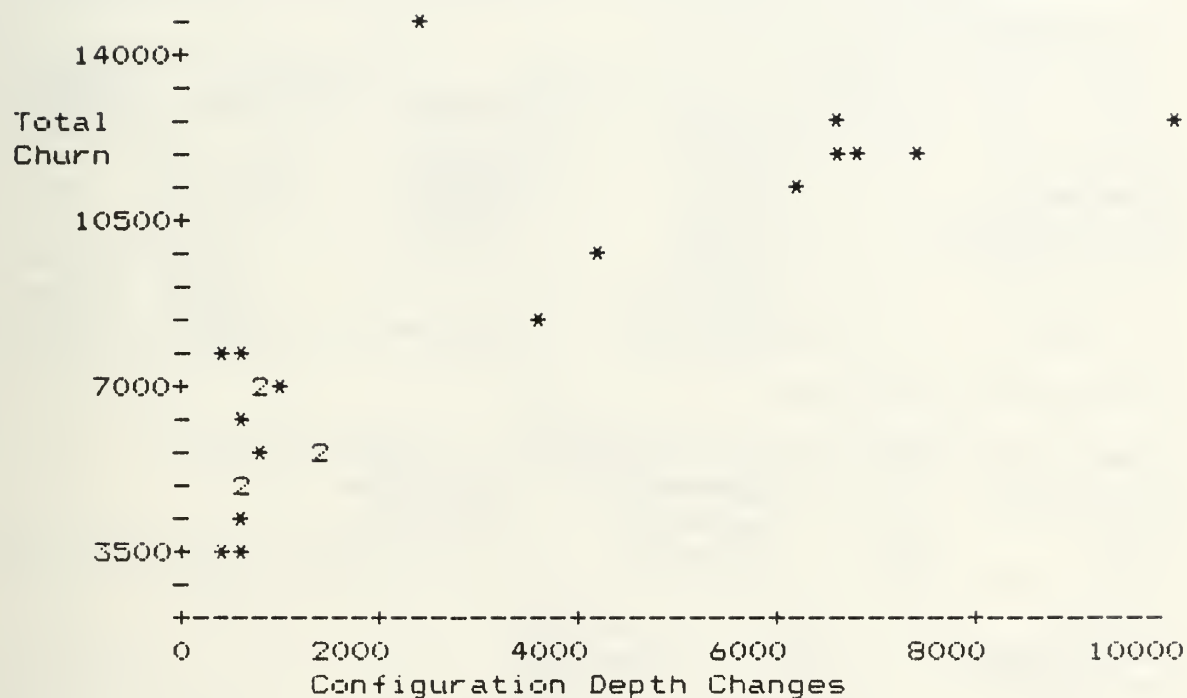


Figure 37. Third Flight FFG-7 ISNSL Data Scatterplot
Configuration Range Changes vs Total Churn

TABLE 71
THIRD FLIGHT FFG-7 TOTAL CHURN MULTIPLE LINEAR REGRESSION

The regression equation is:

$$\text{Total Churn} = 4952 + 0.708 \text{ Config Depth} + 2561 \text{ BRF Update}$$

Predictor	Coef	Stdev	t-ratio
Constant	4952.1	539.3	9.18
Config Depth	0.7079	0.1315	5.38
BRF Update	2561.3	776.0	3.30

s = 1657 R-sq = 77.5% R-sq(adj) = 75.2%

Analysis of Variance

SOURCE	DF	SS	MS
Regression	2	188975904	94487952
Error	20	54919824	2745991
Total	22	243895728	

SOURCE	DF	SEQ SS
Config Depth	1	159063920
BRF Update	1	29911968

TABLE 72
THIRD FLIGHT FFG-7 ISNSL ALLOWANCE ADDITIONS
MULTIPLE LINEAR REGRESSION

The regression equation is:

$$\text{ISNSL Adds} = 2459 + 1.09 \text{ Config Range} + 0.470 \text{ Config Depth} + 502 \text{ BRF Update}$$

Predictor	Coef	Stdev	t-ratio
Constant	2458.8	345.1	7.13
Config Range	1.0949	0.8290	1.32
Config Depth	0.4702	0.1541	3.05
BRF Update	501.6	472.9	1.06

s = 993.2 R-sq = 83.1% R-sq(adj) = 80.4%

Analysis of Variance

SOURCE	DF	SS	MS
Regression	3	91911952	30637312
Error	19	18742304	986437
Total	22	110654256	

SOURCE	DF	SEQ SS
Config Range	1	77126960
Config Depth	1	13675455
BRF Update	1	1109538

TABLE 73
THIRD FLIGHT FFG-7 ISNSL ALLOWANCE DELETIONS
MULTIPLE LINEAR REGRESSION

The regression equation is:

$$\text{ISNSL Deletes} = 2331 + 0.302 \text{ Config Range} + 2214 \text{ BRF Update}$$

Predictor	Coef	Stdev	t-ratio
Constant	2330.9	520.9	4.47
Config Range	0.3019	0.7090	0.43
BRF Update	2214.2	722.3	3.07

s = 1578 R-sq = 38.6% R-sq(adj) = 32.4%

Analysis of Variance

SOURCE	DF	SS	MS
Regression	2	31280128	15640064
Error	20	49809824	2490491
Total	22	81089952	

SOURCE	DF	SEQ SS
Config Range	1	7877030
BRF Update	1	23403088

APPENDIX G

THIRD FLIGHT FFG-7 ISNSL ALLOWANCE ADDITIONS

TABLE 74
THIRD FLIGHT FFG-7 GF ISNSL ALLOWANCE ADDITIONS

Hull	ISNSL	GF SRI Allw	GF SRI Adds	GF SRI Add %	GF OSI Allw	GF OSI Adds	GF OSI Add %
40	4	9444	1140	12.071	3897	168	4.311
41	3	9903	2747	27.739	3925	768	19.567
41	4	9909	1191	12.019	3967	351	8.848
42	2	5843	1697	29.043	4103	790	19.254
42	3	9848	3092	31.397	4053	81	1.999
42	4	9617	886	9.213	3983	119	2.988
43	2	9823	4830	49.170	4001	1012	25.294
43	3	9475	1342	14.164	3890	227	5.836
43	4	9788	2676	27.340	3923	397	10.120
45	2	10044	4803	47.820	3881	1061	27.338
45	3	9793	1899	19.391	4041	417	10.319
45	4	9814	1096	11.168	3997	262	6.555
46	2	9810	4694	47.849	3809	1032	27.094
46	3	10072	1886	18.725	3992	656	16.433
46	4	9813	1770	18.037	3916	214	5.465
47	2	9827	4984	50.717	4067	1077	26.481
47	3	9474	1391	14.682	3899	188	4.822
47	4	9844	1928	19.585	4045	391	9.666
48	2	9941	4842	48.707	3891	1036	26.625
48	3	9822	2474	25.188	4042	713	17.640
48	4	10120	1903	18.804	3936	172	4.370
49	2	9845	4815	48.908	4043	1096	27.108
49	3	9959	1522	15.283	3976	328	8.249
49	4	9893	2814	28.444	3993	257	6.436

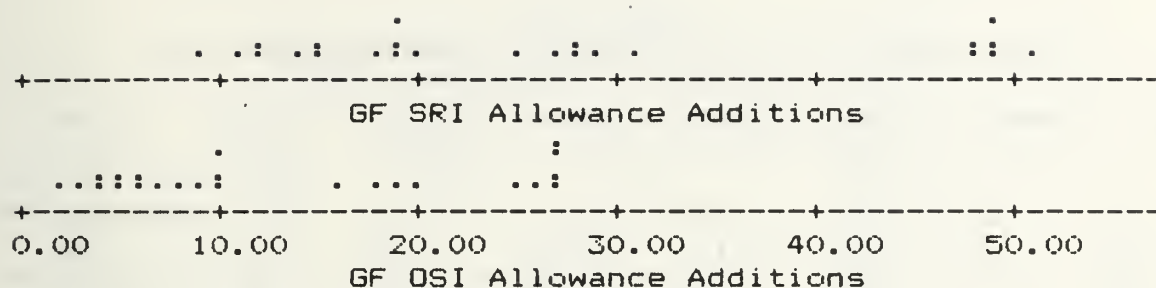


Figure 38. Third Flight FFG-7 GF SRI vs GF OSI Allowance Additions Dotplot

TABLE 75
THIRD FLIGHT FFG-7 GF SRI VS GF OSI
ISNSL ALLOWANCE ADDITIONS T TEST AND
ANALYSIS OF VARIANCE

T Test for GF SRI Adds VS GF OSI Adds

	N	MEAN	STDEV	SE MEAN
GF SRI Adds	24	26.9	14.3	2.9
GF OSI Adds	24	13.45	9.16	1.9

95 PCT CI FOR MU GF SRI Adds - MU GF OSI Adds: (6.4, 20.5)
TTEST MU GF SRI Adds = MU GF OSI Adds (VS NE): T=3.88
P=0.0004 DF=39.2

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	2169	2169	15.05
ERROR	46	6629	144	
TOTAL	47	8798		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI Adds	24	26.89	14.29	(-----*-----)
GF OSI Adds	24	13.45	9.16	(-----*-----)
POOLED STDEV =				12.00 15.0 22.5 30.0

TABLE 76
THIRD FLIGHT FFG-7 CF ISNSL ALLOWANCE ADDITIONS

Hull	ISNSL	CF SRI Allw	CF SRI Addds	CF SRI Add %	CF OSI Allw	CF OSI Addds	CF OSI Add %
40	4	4696	1235	26.298	422	118	27.962
41	3	4018	1113	27.700	380	82	21.578
41	4	4261	646	15.160	415	56	13.494
42	2	2939	731	24.872	351	85	24.216
42	3	4322	1349	31.212	358	90	25.139
42	4	4689	737	15.717	403	59	14.640
43	2	3942	1353	34.322	351	95	27.065
43	3	4488	981	21.858	414	82	19.806
43	4	4562	969	21.240	407	22	5.405
45	2	4440	1921	43.265	359	140	38.997
45	3	4639	909	19.594	398	67	16.834
45	4	4642	416	8.961	404	41	10.148
46	2	3952	1471	37.221	361	108	29.916
46	3	4310	940	21.809	421	84	19.952
46	4	4589	1039	22.641	413	19	4.600
47	2	4296	1953	45.460	342	139	40.643
47	3	4840	1019	21.053	419	99	23.627
47	4	4758	652	13.703	421	33	7.838
48	2	3989	1838	46.076	329	91	27.659
48	3	4617	1681	36.408	425	134	31.529
48	4	4517	817	18.087	424	25	5.896
49	2	4325	1997	46.173	354	151	42.655
49	3	4533	720	15.883	425	96	22.588
49	4	4681	867	18.948	428	39	9.112

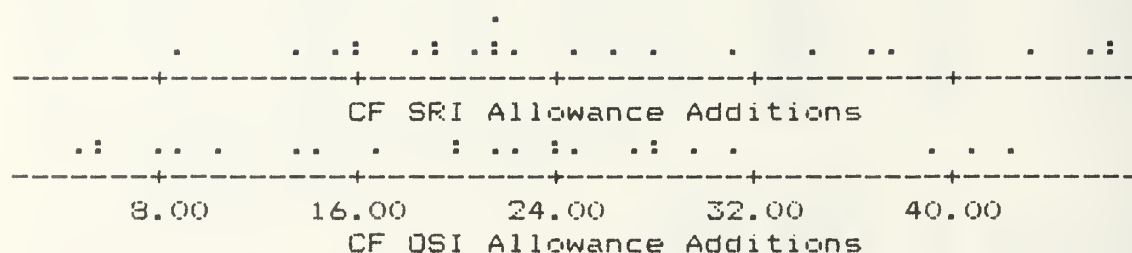


Figure 39. Third Flight FFG-7 CF SRI vs CF OSI Allowance Additions Dotplot

TABLE 77
THIRD FLIGHT FFG-7 CF SRI VS CF OSI
ISNSL ALLOWANCE ADDITIONS T TEST

	N	MEAN	STDEV	SE MEAN
CF SRI ADDS	24	26.4	11.1	2.3
CF OSI ADDS	24	21.3	11.1	2.3

95 PCT CI FOR MU CF SRI ADDS - MU CF OSI ADDS: (-1.3, 11.5)
TTEST MU CF SRI ADDS = MU CF OSI ADDS (VS NE): T=1.59 P=0.12
DF=46.0

TABLE 78
THIRD FLIGHT FFG-7 CF AND GF SRI ISNSL
ALLOWANCE ADDITION PERCENTAGES

Hull	ISNSL	GF SRI Adds	CF SRI ADDS
40	4	12.071	26.299
41	3	27.739	27.700
41	4	12.019	15.160
42	2	29.043	24.872
42	3	31.397	31.212
42	4	9.212	15.717
43	2	49.170	34.322
43	3	14.163	21.858
43	4	27.339	21.240
45	2	47.819	43.265
45	3	19.391	19.594
45	4	11.167	8.961
46	2	47.849	37.221
46	3	18.725	21.809
46	4	18.037	22.641
47	2	50.717	45.460
47	3	14.682	21.053
47	4	19.585	13.703
48	2	48.707	46.076
48	3	25.188	36.408
48	4	18.804	18.087
49	2	48.908	46.173
49	3	15.282	15.883
49	4	28.444	18.948

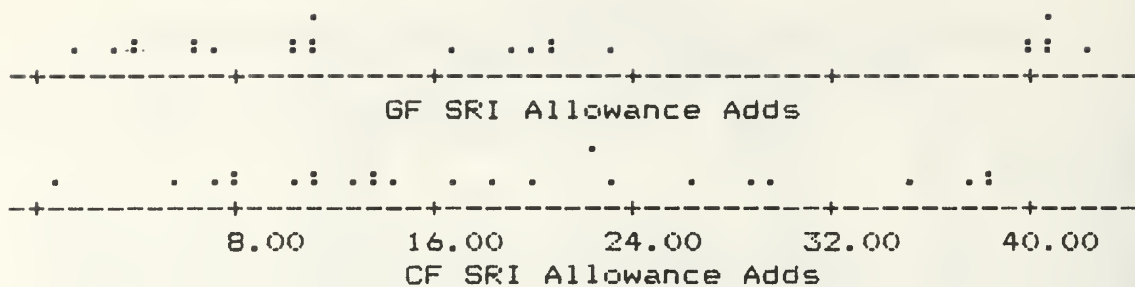


Figure 40. Third Flight FFG-7 GF SRI vs CF SRI Allowance Additions Dotplot

TABLE 79
THIRD FLIGHT FFG-7 GF SRI VS CF SRI
ISNSL ALLOWANCE ADDITIONS T TEST AND
ANALYSIS OF VARIANCE

T Test for GF SRI Adds VS CF SRI Adds

	N	MEAN	STDEV	SE MEAN
GF SRI Adds	24	26.9	14.3	2.9
CF SRI Adds	24	26.4	11.1	2.3

95 PCT CI FOR MU GF SRI Adds - MU CF SRI Adds: (-7.0, 7.9)
TTEST MU GF SRI Adds = MU CF SRI Adds (VS NE): T=0.13 P=0.89
DF=43.3

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	3	3	0.02
ERROR	46	7531	164	
TOTAL	47	7534		

INDIVIDUAL 95 PCT CI'S FOR MEAN BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI Adds	24	26.89	14.29	(-----*-----)
CF SRI Adds	24	26.40	11.10	(-----*-----)
POOLED STDEV = 12.80				-----+-----+-----+-----
				24.0 27.0 30.0

TABLE 80
THIRD FLIGHT FFG-7 CF AND GF OSI ISNSL
ALLOWANCE ADDITION PERCENTAGES

Hull	ISNSL	GF OSI Adds	CF OSI Adds
40	4	4.311	27.962
41	3	19.566	21.578
41	4	8.848	13.494
42	2	19.254	24.216
42	3	1.998	25.139
42	4	2.987	14.640
43	2	25.293	27.065
43	3	5.835	19.806
43	4	10.119	5.405
45	2	27.338	38.997
45	3	10.319	16.834
45	4	6.554	10.148
46	2	27.093	29.916
46	3	16.432	19.952
46	4	5.464	4.600
47	2	26.481	40.643
47	3	4.821	23.627
47	4	9.666	7.838
48	2	26.625	27.659
48	3	17.639	31.529
48	4	4.369	5.896
49	2	27.108	42.655
49	3	8.249	22.588
49	4	6.436	9.112

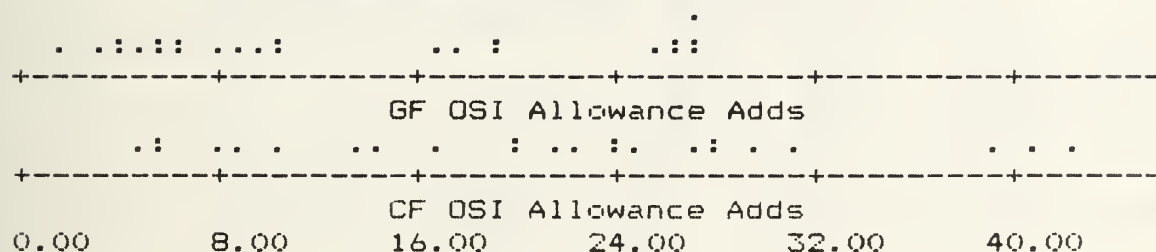


Figure 41. Third Flight FFG-7 GF OSI vs CF OSI Allowance Additions Dotplot

TABLE 81
THIRD FLIGHT FFG-7 GF OSI vs CF OSI
ISNSL ALLOWANCE ADDITIONS
ANALYSIS OF VARIANCE

SOURCE	DF	SS	MS	F
FACTOR	1	740	740	7.16
ERROR	46	4753	103	
TOTAL	47	5493		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF OSI	24	13.45	9.16	(-----*-----)
Adds				
CF OSI	24	21.30	11.08	(-----*-----)
Adds				
POOLED STDEV = 10.16 <div style="display: flex; justify-content: space-between; width: 100%;"> 10.0 15.0 20.0 25.0 </div>				

TABLE 82
THIRD FLIGHT FFG-7 ISNSL ALLOWANCE ADDITIONS
ANALYSIS OF VARIANCE
ALL SUPPLIER AND STORAGE LOCATION

SOURCE	DF	SS	MS	F
FACTOR	3	2806	935	7.01
ERROR	92	12284	134	
TOTAL	95	15090		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI Adds	24	26.89	14.29	(-----+-----+-----+-----+)
GF OSI ADDS	24	13.45	9.16	(-----*-----)
CF SRI ADDS	24	26.40	11.10	(-----*-----)
CF OSI ADDS	24	21.30	11.08	(-----*-----)
POOLED STDEV =		11.56		-----+-----+-----+-----+
				15.0 22.5 30.0

APPENDIX H

THIRD FLIGHT FFG-7 ISNSL ALLOWANCE ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE

TABLE 83
THIRD FLIGHT FFG-7 ISNSL ALLOWANCE ADDITION
PERCENTAGES ANNUAL BRF UPDATE A FACTOR

HULL	ISNSL	GF SRI % Adds	GF OSI % Adds	CF SRI % Adds	CF OSI % Adds
41	3	27.74	19.56	27.70	21.58
42	2	29.04	19.25	24.87	24.22
42	4	9.21	2.99	15.72	14.64
43	2	49.17	25.29	34.32	27.06
43	4	27.34	10.12	21.24	5.40
45	3	19.39	10.32	19.59	16.83
46	2	47.85	27.09	37.22	29.92
46	4	18.04	5.46	22.64	4.60
47	2	50.72	26.48	45.46	40.64
47	4	19.58	9.67	13.70	7.84
48	2	48.71	26.63	46.08	27.66
48	3	25.19	17.64	36.41	31.53
49	2	48.91	27.11	46.17	42.66
49	4	28.44	6.44	18.95	9.11

TABLE 84
THIRD FLIGHT FFG-7 ISNSL ALLOWANCE ADDITION
PERCENTAGES ANNUAL BRF UPDATE NOT A FACTOR

HULL	ISNSL	GF SRI % Adds	GF OSI % Adds	CF SRI % Adds	CF OSI % Adds
40	4	12.07	4.31	26.30	27.96
41	4	12.02	8.85	15.16	13.49
42	3	31.40	2.00	31.21	25.14
43	3	14.16	5.84	21.86	19.81
45	2	47.82	27.34	43.26	29.00
45	4	11.17	6.55	8.96	10.15
46	3	18.73	16.43	21.81	19.95
47	3	14.68	4.82	21.05	23.63
48	4	18.80	4.37	18.09	5.90
49	3	15.28	8.25	15.88	22.53

TABLE 85
THIRD FLIGHT FFG-7 GF SRI ISNSL ALLOWANCE
ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update A Factor			Annual BRF Update Not a Factor		
HULL	ISNSL	GF SRI % Adds	Hull	ISNSL	GF SRI % Adds
41	3	27.74	40	4	12.07
42	2	29.04	41	4	12.02
42	4	9.21	42	3	31.40
43	2	49.17	43	3	14.16
43	4	27.34	45	2	47.82
45	3	19.39	45	4	11.17
46	2	47.85	46	3	18.73
46	4	18.04	47	3	14.68
47	2	50.72	48	4	18.80
47	4	19.58	49	3	15.28
48	2	48.71			
48	3	25.19			
49	2	48.91			
49	4	28.44			

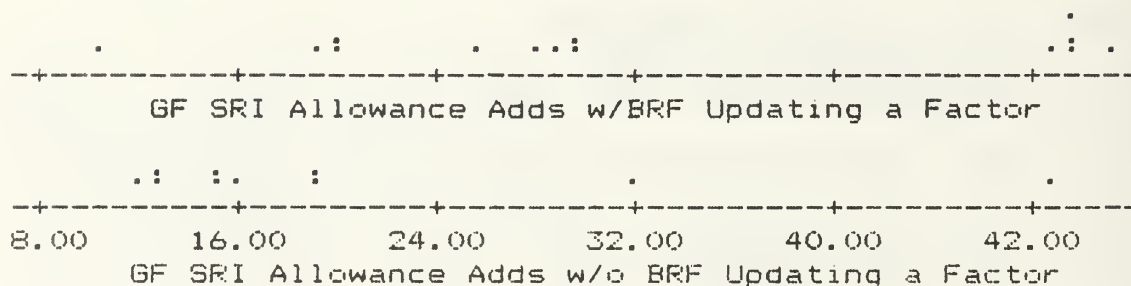


Figure 42. Third Flight FFG-7 GF SRI Allowance Additions
Dotplot Stratified by Annual BRF Update

TABLE 86
THIRD FLIGHT FFG-7 CLASS GF SRI ISNSL ALLOWANCE
ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for GF SRI Adds w/BRF VS GF SRI Adds w/o BRF

	N	MEAN	STDEV	SE MEAN
GF SRI Adds w/BRF	14	32.1	14.1	3.8
GF SRI Adds w/o BRF	10	19.6	11.5	3.6

95 PCT CI FOR MU GF SRI Adds w/BRF - MU GF SRI Adds w/o BRF:
(1.6, 23.4)

TTEST MU GF SRI Adds w/BRF = MU GF SRI Adds w/o BRF (VS NE):
T=2.38 P=0.027 DF=21.5

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	909	909	5.27
ERROR	22	3791	172	
TOTAL	23	4700		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI Adds w/BRF	14	32.09	14.13	-----+-----+-----+----- (-----*-----)
GF SRI Adds w/o BRF	10	19.61	11.52	(-----*-----)
POOLED STDEV = 13.13				-----+-----+-----+----- 16.0 24.0 32.0

TABLE 87
THIRD FLIGHT FFG-7 GF OSI ISNSL ALLOWANCE
ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE

HULL	ISNSL	GF OSI % Adds	HULL	ISNSL	GF OSI % Adds
41	3	19.56	40	4	4.31
42	2	19.25	41	4	8.85
42	4	2.99	42	3	2.00
43	2	25.29	43	3	5.84
43	4	10.12	45	2	27.34
45	3	10.32	45	4	6.55
46	2	27.09	46	3	16.43
46	4	5.46	47	3	4.82
47	2	26.48	48	4	4.37
47	4	9.67	49	3	8.25
48	2	26.63			
48	3	17.64			
49	2	27.11			
49	4	6.44			

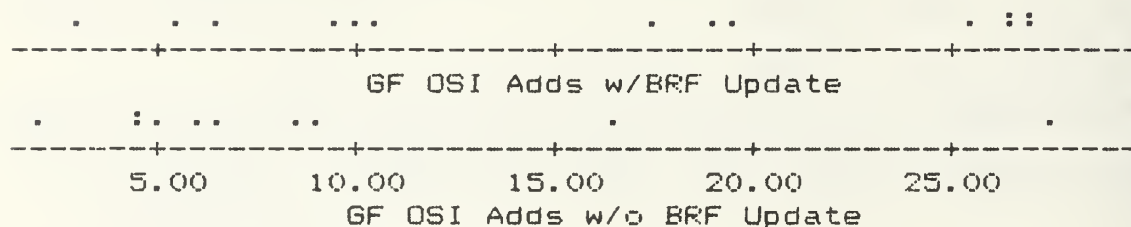


Figure 43. Third Flight FFG-7 GF OSI Allowance Additions
Dotplot Stratified by Annual BRF Update

TABLE 88
THIRD FLIGHT FFG-7 GF OSI ISNSL ALLOWANCE
ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for GF OSI Adds w/BRF VS GF OSI Adds w/o BRF

	N	MEAN	STDEV	SE MEAN
GF OSI Adds w/BRF	14	16.72	9.00	2.4
GF OSI Adds w/o BRF	10	8.88	7.59	2.4

95 PCT CI FOR MU GF OSI Adds w/BRF - MU GF OSI Adds w/o BRF:
(0.8, 14.9)

TTEST MU GF OSI Adds w/BRF = MU GF OSI Adds w/o BRF (VS NE):
T=2.31 P=0.031 DF=21.3

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	358.7	358.7	5.02
ERROR	22	1570.8	71.4	
TOTAL	23	1929.5		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF OSI Adds w/BRF	14	16.71	9.00	(-----*-----)
GF OSI Adds w/o BRF	10	8.87	7.58	(-----*-----)
POOLED STDEV = 8.450				-----+-----+-----+-----+-----
				5.0 10.0 15.0 20.0

TABLE 89
THIRD FLIGHT FFG-7 CF SRI ISNSL ALLOWANCE
ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE

HULL	ISNSL	CF SRI % Adds	HULL	ISNSL	CF SRI % Adds
41	3	27.70	40	4	26.30
42	2	24.87	41	4	15.16
42	4	15.72	42	3	31.21
43	2	34.32	43	3	21.86
43	4	21.24	45	2	43.26
45	3	19.59	45	4	8.96
46	2	37.22	46	3	21.81
46	4	22.64	47	3	21.05
47	2	45.46	48	4	18.09
47	4	13.70	49	3	15.88
48	2	46.08			
48	3	36.41			
49	2	46.17			
49	4	18.95			

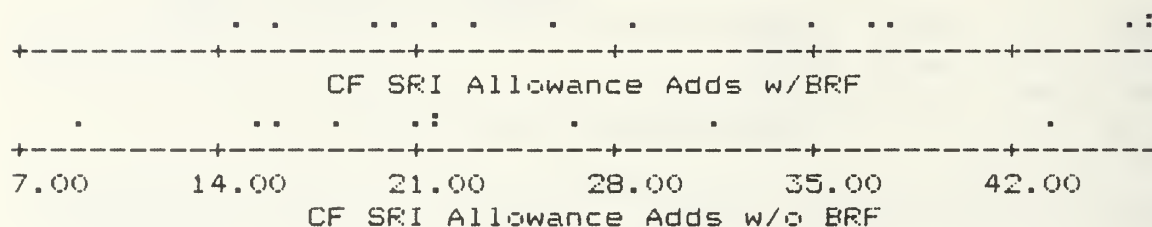


Figure 44 .Third Flight FFG-7 CF SRI Allowance Additions
Dotplot Stratified by Annual BRF Update

TABLE 90
THIRD FLIGHT FFG-7 CF SRI ISNSL ALLOWANCE
ADDITIONS STRATIFIED by Annual BRF Update
T TEST AND ANALYSIS OF VARIANCE

T Test for CF SRI Adds w/BRF VS CF SRI Adds w/o BRF

	N	MEAN	STDEV	SE MEAN
CF SRI Adds w/BRF	14	29.3	11.5	3.1
CF SRI Adds w/o BRF	10	22.36	9.57	3.0

95 PCT CI FOR MU CF SRI Adds w/BRF - MU CF SRI Adds w/o BRF:
(-2.0, 15.9)

TTEST MU CF SRI Adds w/BRF = MU CF SRI Adds w/o BRF (VS NE):
T=1.61 P=0.12 DF=21.4

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	280	280	2.42
ERROR	22	2551	116	
TOTAL	23	2831		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
CF SRI Adds w/BRF	14	29.29	11.52	-----+-----+-----+----- (-----*-----)
CF SRI Adds w/o BRF	10	22.36	9.57	(-----*-----)
POOLED STDEV =	10.77	18.0	24.0	30.0

TABLE 91
THIRD FLIGHT FFG-7 CF OSI ISNSL ALLOWANCE
ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update A Factor			Annual BRF Update Not a Factor		
HULL	ISNSL	CF OSI % Adds	HULL	ISNSL	CF OSI % Adds
41	3	21.58	40	4	27.96
42	2	24.22	41	4	13.49
42	4	14.64	42	3	25.14
43	2	27.06	43	3	19.81
43	4	5.40	45	2	29.00
45	3	16.83	45	4	10.15
46	2	29.92	46	3	19.95
46	4	4.60	47	3	23.63
47	2	40.64	48	4	5.90
47	4	7.84	49	3	22.53
48	2	27.66			
48	3	31.53			
49	2	42.66			
49	4	9.11			

TABLE 92
THIRD FLIGHT FFG-7 CF OSI ISNSL ALLOWANCE
ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for CF OSI Adds w/BRF VS CF OSI Adds w/o BRF

	N	MEAN	STDEV	SE MEAN
CF OSI Adds w/BRF	14	21.7	12.5	3.3
CF OSI Adds w/o BRF	10	19.76	7.66	2.4

95 PCT CI FOR MU CF OSI Adds w/BRF - MU CF OSI Adds w/o BRF:
(-6.6, 10.5)

TTEST MU CF OSI Adds w/BRF = MU CF OSI Adds w/o BRF (VS NE):
T=0.47 P=0.64 DF=21.6

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	22	22	0.19
ERROR	22	2543	116	
TOTAL	23	2565		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
CF OSI Adds w/BRF	14	21.69	12.45	-----+-----+-----+----- (-----*-----)
CF OSI Adds w/o BRF	10	19.76	7.66	(-----*-----)
POOLED STDEV = 10.75				-----+-----+-----+----- 15.0 20.0 25.0

TABLE 93
THIRD FLIGHT FFG-7 ANALYSIS OF VARIANCE
STRATIFIED BY ANNUAL BRF UPDATE

SOURCE	DF	SS	MS	F
FACTOR	9	12990.5	1443.4	14.51
ERROR	106	10542.9	99.5	
TOTAL	115	23533.3		

INDIVIDUAL 95 PCT CI'S FOR MEAN BASED ON POOLED STDEV				
LEVEL	N	MEAN	STDEV	
GF SRI	14	32.095	14.133	(---*---)
GF OSI	14	16.718	9.000	(---*---)
CF SRI	14	29.291	11.524	(---*---)
CF OSI	14	21.692	12.450	(---*---)
				0 16 32
Annual BRF Update a Factor				

GF SRI	10	19.613	11.521	(---*---)
GF OSI	10	8.876	7.586	(---*---)
CF SRI	10	22.358	9.572	(---*---)
CF OSI	10	19.756	7.660	(---*---)
				0 16 32
Annual BRF Update Not a Factor				

POOLED STDEV = 9.973

APPENDIX I

THIRD FLIGHT FFG-7 ISNSL ALLOWANCE DELETIONS

TABLE 94
THIRD FLIGHT FFG-7 ALLOWANCE DELETIONS

Hull	ISNSL	GF Allw	GF Del	GF % Del	CF Allw	CF Del	CF % Del
40	4	13341	2111	15.823	5118	489	9.554
41	3	13828	2971	21.485	4398	1040	23.647
41	4	13867	1650	11.898	4676	424	9.067
42	3	12940	8321	64.304	4681	1084	23.157
42	4	13600	1347	9.904	5092	349	6.853
43	2	13824	3631	26.265	4293	1120	26.089
43	3	13365	2015	15.076	4902	369	7.527
43	4	13711	2438	17.781	4969	1203	24.210
45	2	13925	3096	22.233	4799	428	8.918
45	3	13834	2929	21.172	5037	1111	22.056
45	4	13811	1277	9.246	5046	559	11.078
46	2	13619	3854	28.298	4313	1077	24.971
46	3	14064	1963	13.957	4731	579	12.238
46	4	13729	2881	20.984	5279	984	18.639
47	2	13894	3164	22.772	4638	916	19.749
47	3	13373	2108	15.763	5259	417	7.929
47	4	13889	2231	16.063	5179	996	19.231
48	2	13832	3771	27.262	4318	863	19.986
48	3	13864	3616	26.081	5042	1038	20.587
48	4	14056	1927	13.709	4941	809	16.373
49	2	13888	3506	25.244	4679	936	20.004
49	3	13935	1710	12.272	4958	517	10.427
49	4	13828	3017	21.818	5109	1017	19.906

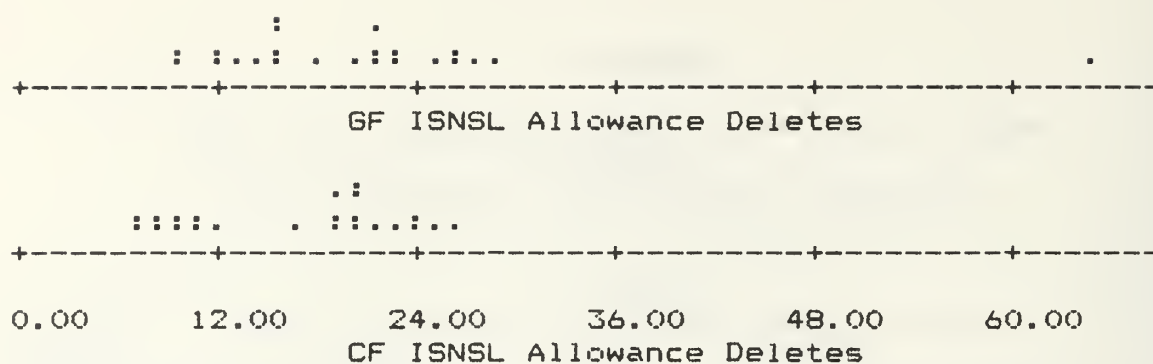


Figure 45. Third Flight FFG-7 GF vs CF ISNSL Allowance Deletions Dotplot

TABLE 95
THIRD FLIGHT FFG-7 GF VS CF ISNSL ALLOWANCE DELETIONS
T TEST AND ANALYSIS OF VARIANCE

T Test GF Deletes VS CF Deletes

	N	MEAN	STDEV	SE MEAN
GF Deletes	23	20.8	11.1	2.3
CF Deletes	23	16.62	6.46	1.3

95 PCT CI FOR MU GF Deletes - MU CF Deletes: (-1.2, 9.6)
TTEST MU GF Deletes = MU CF Deletes (VS NE): T=1.58 P=0.12
DF=35.4

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	205.5	205.5	2.51
ERROR	44	3608.3	82.0	
TOTAL	45	3813.8		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF	23	20.84	11.06	(-----*-----)
Deletes				
CF	23	16.62	6.46	(-----*-----)
Deletes				
POOLED STDEV = 9.06				-----+-----+-----+-----
				16.0 19.2 22.4

APPENDIX J

THIRD FLIGHT FFG-7 ISNSL ALLOWANCE DELETIONS STRATIFIED BY ANNUAL BRF UPDATE

TABLE 96
THIRD FLIGHT FFG-7 ISNSL ALLOWANCE DELETIONS
ANNUAL BRF UPDATE A FACTOR

HULL	ISNSL	GF Allw	GF Del	GF Del %	CF Allw	CF Del	CF Del %
41	3	13828	2971	21.4854	4398	1040	23.6471
42	3	13600	1347	9.9044	4681	1084	23.1574
43	2	13824	3631	26.2659	4923	1120	22.7504
43	4	13711	2438	17.7813	4469	1203	26.9188
45	3	13834	2929	21.1725	5037	1111	22.0568
46	2	13619	3854	28.2987	4313	1077	24.9710
46	4	13729	2881	20.9848	5279	984	18.6399
47	2	13894	3164	22.7724	4639	916	19.7456
47	4	13889	2231	16.0631	5179	996	19.2315
48	2	13832	3771	27.2629	4318	863	19.9861
48	3	13864	3616	26.0819	5042	1038	20.5871
49	2	13888	3505	25.2376	4679	936	20.0043
49	4	13828	3017	21.8180	5109	1017	19.9060

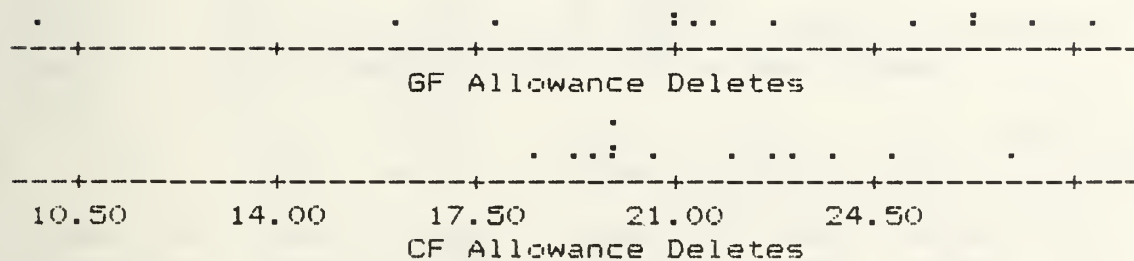


Figure 46. Third Flight FFG-7 GF vs CF ISNSL Allowance
Deletions Dotplot - Annual BRF Update a Factor

TABLE 97
THIRD FLIGHT FFG-7 GF VS CF ISNSL ALLOWANCE
DELETIONS ANNUAL BRP UPDATE A FACTOR
T TEST AND ANALYSIS OF VARIANCE

T Test for GF Deletes VS CF Deletes

	N	MEAN	STDEV	SE MEAN
GF Deletes	13	21.93	5.12	1.4
CF Deletes	13	21.66	2.49	0.69

95 PCT CI FOR MU GF Deletes - MU CF Deletes: (-3.1, 3.60)
TTEST MU GF Deletes = MU CF Deletes (VS NE): T=0.17 P=0.87
DF=17.4

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	0.5	0.5	0.03
ERROR	24	389.2	16.2	
TOTAL	25	389.7		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF	13	21.933	5.120	(-----*-----)
Deletes				
CF	13	21.662	2.493	(-----*-----)
Deletes				
POOLED STDEV =				4.027 19.6 21.0 22.4 23.8

TABLE 98
THIRD FLIGHT FFG-7 ISNSL ALLOWANCE DELETIONS
ANNUAL BRP UPDATE NOT A FACTOR

HULL	ISNSL	GF Allw	GF Del	GF Del %	CF Allw	CF Del	CF Del %
40	4	13341	2111	15.8234	5118	489	9.5545
41	4	13876	1650	11.8910	4676	424	9.0676
42	4	12940	8321	64.3045	5092	349	6.8539
43	3	13365	2015	15.0767	4902	369	7.5275
45	2	13925	3096	22.2334	4799	428	8.9185
45	4	13811	1277	9.2462	5046	559	11.0781
46	3	14064	1963	13.9576	4731	579	12.2384
47	3	13373	2108	15.7631	5259	417	7.9293
48	3	14056	1927	13.7094	4941	809	16.3732
49	3	13935	1710	12.2713	4958	517	10.4276

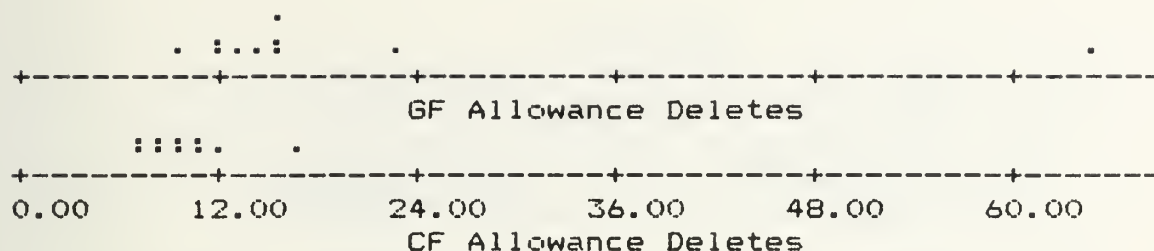


Figure 47. Third Flight FFG-7 GF vs CF ISNSL Allowance Deletions Dotplot - Annual BRF Update Not a Factor

TABLE 99
THIRD FLIGHT FFG-7 GF VS CF ISNSL Allowance
DELETIONS ANNUAL BRF UPDATE NOT A FACTOR
T TEST AND ANALYSIS OF VARIANCE

T Test for GF Deletes VS CF Deletes

	N	MEAN	STDEV	SE MEAN
GF Deletes	10	19.4	16.1	5.1
CF Deletes	10	10.00	2.78	0.88

95 PCT CI FOR MU GF Deletes - MU CF Deletes: (-2.3, 21.14)
TTEST MU GF Deletes = MU CF Deletes (VS NE): T=1.82 P=0.10
DF=9.5

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	445	445	3.32
ERROR	18	2411	134	
TOTAL	19	2856		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF Deletes	10	19.43	16.13	(-----*-----)
CF Deletes	10	10.00	2.78	(-----*-----)

POOLED STDEV = 11.57

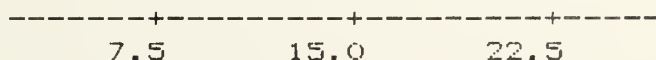


TABLE 100
THIRD FLIGHT FFG-7 GF ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update A Factor			Annual BRF Update Not a Factor		
HULL	ISNSL	GF Del %	HULL	ISNSL	GF Del %
41	3	21.4854	40	4	15.8234
42	3	9.9044	41	4	11.8910
43	2	26.2659	42	4	64.3045
43	4	17.7813	43	3	15.0767
45	3	21.1725	45	2	22.2334
46	2	28.2987	45	4	9.2462
46	4	20.9848	46	3	13.9576
47	2	22.7724	47	3	15.7631
47	4	16.0631	48	3	13.7094
48	2	27.2629	49	3	12.2713
48	3	26.0819			
49	2	25.2376			
49	4	21.8180			



Figure 48. Third Flight FFG-7 GF ISNSL Allowance Deletions
Dotplot Stratified by Annual BRF Update

TABLE 101
THIRD FLIGHT FFG-7 GF ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for GF Deletes w/BRF VS GF Deletes w/o BRF

	N	MEAN	STDEV	SE MEAN
GF Deletes w/BRF	13	21.93	5.12	1.4
GF Deletes w/o BRF	10	19.4	16.1	5.1

95 % CI FOR MU GF Delete w/BRF - MU GF Deletes w/o BRF:
(-9.3, 14.3)

TTEST MU GF Deletes w/BRF = MU GF Deletes w/o BRF (VS NE):
T=0.47 P=0.65 DF=10.4

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	35	35	0.28
ERROR	21	2656	126	
TOTAL	22	2692		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF Del w/BRF	13	21.93	5.12	-----+-----+-----+----- (-----*-----)
GF Del w/o BRF	10	19.43	16.13	(-----*-----)
POOLED STDEV = 11.25				-----+-----+-----+----- 15.0 20.0 25.0

TABLE 102
THIRD FLIGHT FFG-7 CF ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update A Factor			Annual BRF Update Not a Factor		
HULL	ISNSL	CF Del %	HULL	ISNSL	CF Del %
41	3	23.6471	40	4	9.5545
42	3	23.1574	41	4	9.0676
43	2	22.7504	42	4	6.8539
43	4	26.9188	43	3	7.5275
45	3	22.0568	45	2	8.9185
46	2	24.9710	45	4	11.0781
46	4	18.6399	46	3	12.2384
47	2	19.7456	47	3	7.9293
47	4	19.2315	48	3	16.3732
48	2	19.9861	49	3	10.4276
48	3	20.5871			
49	2	20.0043			
49	4	19.9060			

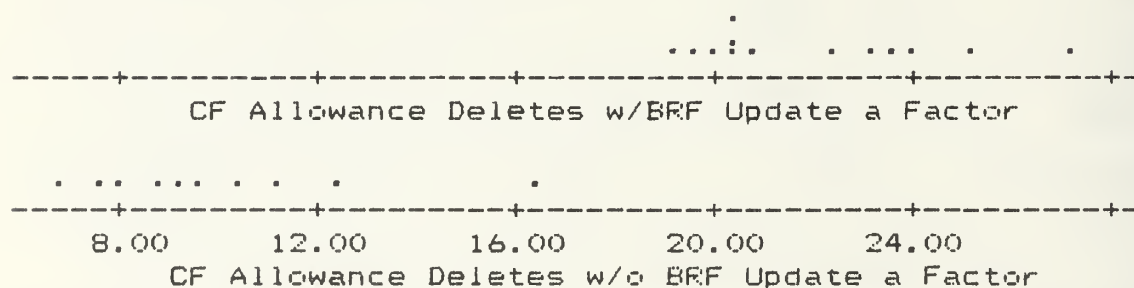


Figure 49. Third Flight FFG-7 CF ISNSL Allowance Deletions
Dotplot Stratified by Annual BRF Update

TABLE 103
THIRD FLIGHT FFG-7 CF ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for CF Deletes w/BRF VS CF Deletes w/o BRF

	N	MEAN	STDEV	SE MEAN
CF Deletes w/BRF	13	21.66	2.49	0.69
CF Deletes w/o BRF	10	10.00	2.78	0.88

95 PCT CI FOR MU CF Deletes w/BRF - MU CF Deletes w/o BRF:
(9.31, 14.01)

TTEST MU CF Deletes w/BRF = MU CF Deletes w/o BRF (VS NE):
T=10.43 F=0.0000 DF=18.3

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	769.08	769.08	112.07
ERROR	21	144.12	6.86	
TOTAL	22	913.20		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	-----+-----+-----+-----
CF Deletes w/BRF	13	21.66	2.49	(--*--)
CF Deletes w/o BRF	10	9.99	2.77	(--*--)

POOLED STDEV = 620

-----+-----+-----+-----
10.0 15.0 20.0

TABLE 104

THIRD FLIGHT FFG-7 ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE
ANALYSIS OF VARIANCE

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF Del	13	21.93	5.12	(-----*-----)
w/BRF				
CF Del	13	21.66	2.49	(-----*-----)
w/BRF				
GF Del	10	19.42	16.13	(-----*-----)
w/o BRF				
CF Del	10	9.99	2.79	(-----*-----)
w/o BRF				

POOLED STDEV = 8.165

-----+-----+-----+-----+
6.0 12.0 18.0 24.0

APPENDIX K

FOURTH FLIGHT FFG-7 CORRELATION AND REGRESSION ANALYSIS

TABLE 105
FOURTH FLIGHT FFG-7 REGRESSION AND CORRELATION DATA

Independent Variables					Dependent Variables		
Hull	ISNSL	Config Range	Config Depth	BRF Update	Allw Adds	Allw Deletes	Total Churn
50	2	359	1224	1	4647	3388	8035
50	3	57	1225	0	4143	1833	5976
51	2	302	2324	1	3493	3024	6517
51	3	137	2417	0	2880	2278	5158
52	2	505	3433	0	3034	2273	5307
52	3	73	1066	1	4856	3402	8258
53	2	371	1248	1	4497	3919	8416
54	2	106	1997	0	2502	2694	5196
54	3	108	1376	1	3117	3248	6365
55	2	121	1410	0	3006	2407	5413
55	3	25	272	1	4699	4338	9037
56	2	44	1304	0	2531	1664	4195
56	3	26	236	1	3701	3059	6760
57	2	212	2708	1	3477	2772	6249
57	3	34	106	0	3042	1583	4625
58	2	24	287	1	2544	3019	5563
58	3	61	230	0	2835	1379	4214

TABLE 106
FOURTH FLIGHT FFG-7 CORRELATION TABLE

	Config Range	Config Depth	Allw Adds	Allw Deletes	Total Churn
Config Depth	0.686				
Allw Adds	0.195	-0.175			
Allw Deletes	0.205	-0.064	0.644		
Total Churn	0.221	-0.131	0.904	0.909	
BRF Update	0.118	-0.170	0.568	0.829	0.773

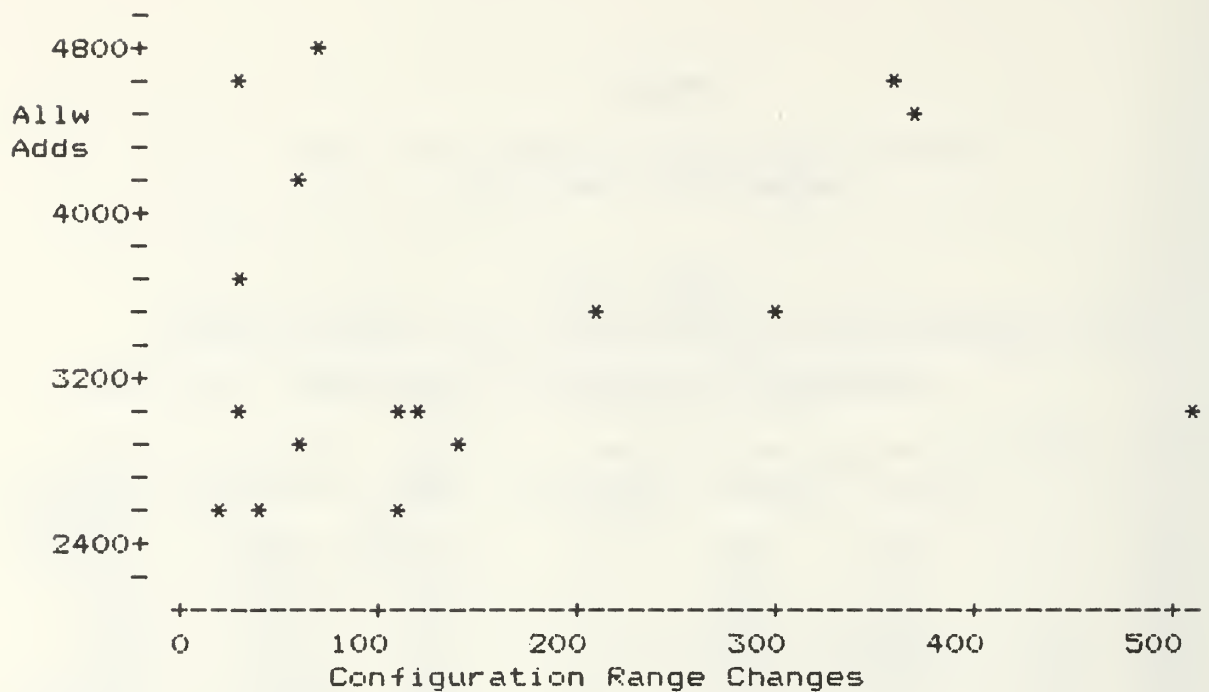


Figure 50. Fourth Flight FFG-7 ISNSL Data Scatterplot
Configuration Range Changes vs ISNSL Allowance Additions

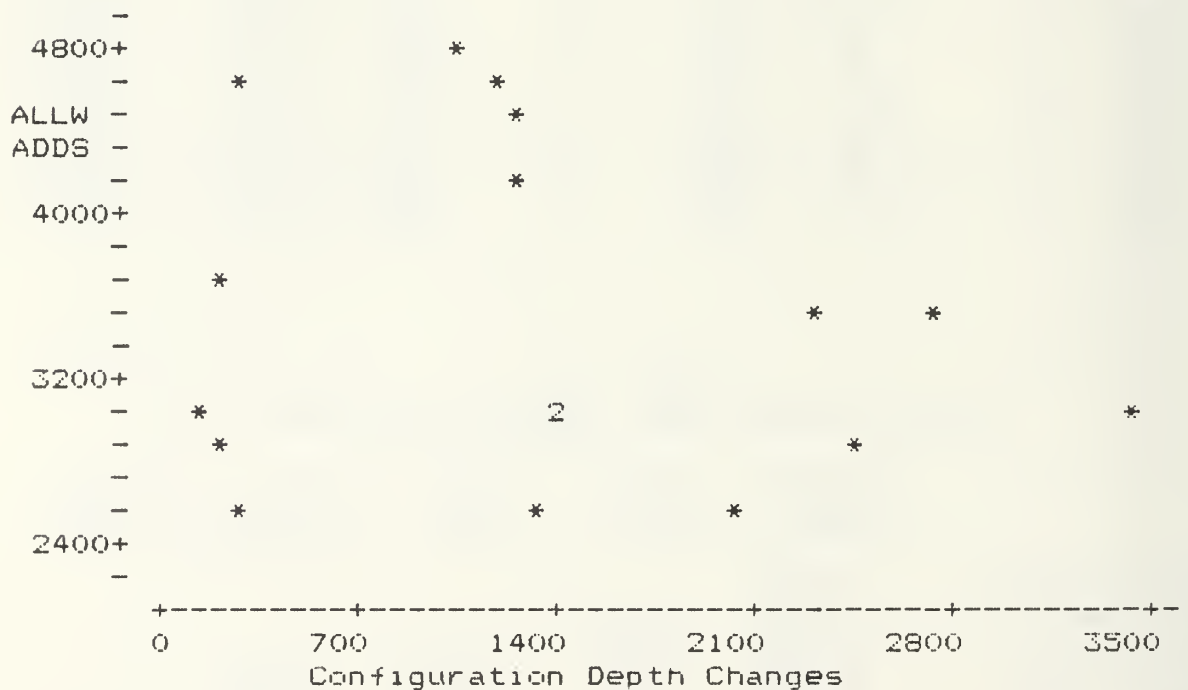


Figure 51. Fourth Flight FFG-7 ISNSL Data Scatterplot
Configuration Depth Changes vs ISNSL Allowance Additions

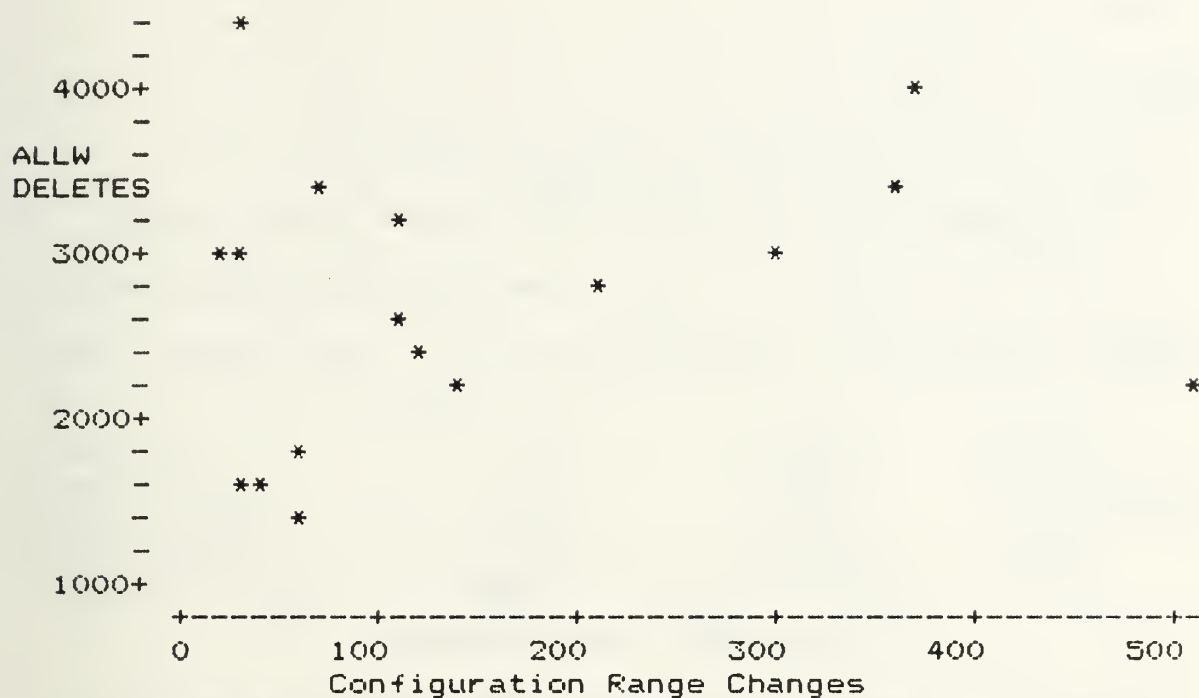


Figure 52. Fourth Flight FFG-7 ISNSL Data Scatterplot Configuration Range Changes vs ISNSL Allowance Deletions



Figure 53. Fourth Flight FFG-7 ISNSL Data Scatterplot Configuration Depth Changes vs ISNSL Allowance Deletions

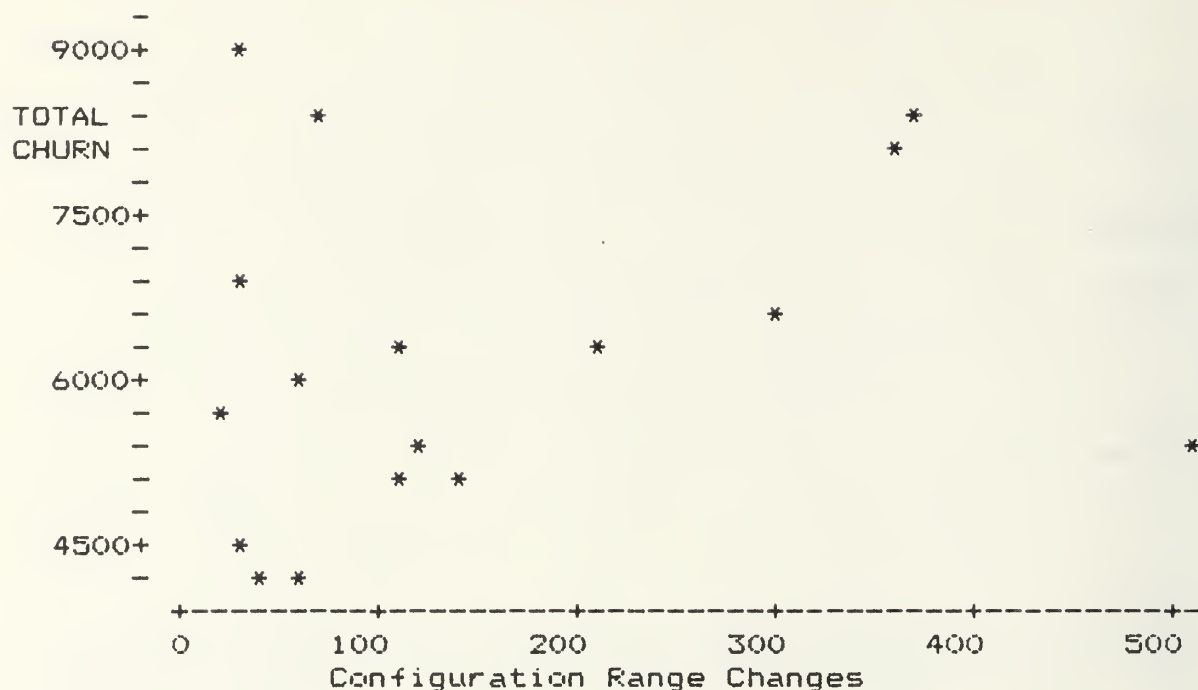


Figure 54. Fourth Flight FFG-7 ISNSL Data Scatterplot
Configuration Range Changes vs ISNSL Total Churn

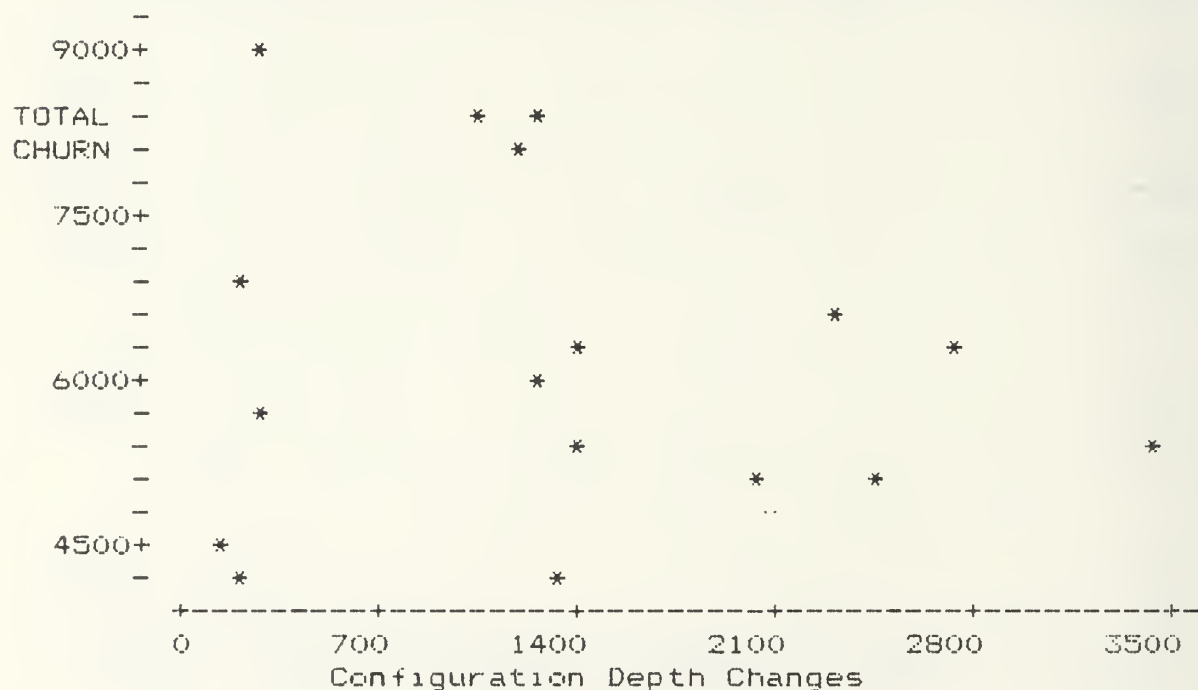


Figure 55. Fourth Flight FFG-7 ISNSL Data Scatterplot
Configuration Depth Changes ISNSL Total Churn

TABLE 107
FOURTH FLIGHT FFG-7 TOTAL CHURN MULTIPLE REGRESSION

The regression equation is:

$$\text{TOTAL CHURN} = 5101 + 2.78(\text{Config Range}) - 0.30(\text{Config Depth}) + 2043(\text{BRF Update})$$

Predictor	Coef	Stdev	t-ratio
Constant	5101.0	536.8	9.50
CONFIG RANGE	2.784	2.481	1.12
CONFIG DEPTH	-0.3043	0.3768	-0.81
BRF UPDATE	2042.7	522.1	3.91

s = 1001 R-sq = 63.2% R-sq(adj) = 54.8%

Analysis of Variance

SOURCE	DF	SS	MS
Regression	3	22397392	7465797
Error	13	13018731	1001441
Total	16	35416112	

SOURCE	DF	SEQ SS
CONFIG RANGE	1	1729959
CONFIG DEPTH	1	5341216
BRF UPDATE	1	15326219

TABLE 108
FOURTH FLIGHT FFG-7 ISNSL ALLOWANCE DELETIONS
MULTIPLE LINEAR REGRESSION

The regression equation is:

$$\text{ALLW DELETES} = 1931 + 0.62 \text{ CONFIG RANGE} + 0.001 \text{ CONFIG DEPTH} + 1308 \text{ BRF UPDATE}$$

Predictor	Coef	Stdev	t-ratio
Constant	1931.0	270.9	7.13
CONFIG RANGE	0.617	1.252	0.49
CONFIG DEPTH	0.0005	0.1902	0.00
BRF UPDATE	1317.7	263.6	5.00

s = 505.1 R-sq = 69.9% R-sq(adj) = 63.0%

Analysis of Variance

SOURCE	DF	SS	MS
Regression	3	7715009	2571669
Error	13	3316768	255136
Total	16	11031777	

SOURCE	DF	SEQ SS
CONFIG RANGE	1	465434
CONFIG DEPTH	1	871382
BRF UPDATE	1	6378192

TABLE 109
FOURTH FLIGHT FFG-7 ISNSL ALLOWANCE ADDITIONS
MULTIPLE LINEAR REGRESSION

The regression equation is:

$$\text{ALLW ADDS} = 3170 + 2.17 \text{ CONFIG RANGE} - 0.305 \text{ CONFIG DEPTH} + 725 \text{ BRF UPDATE}$$

Predictor	Coef	Stdev	t-ratio
Constant	3170.0	373.1	8.50
CONFIG RANGE	2.167	1.724	1.26
CONFIG DEPTH	-0.3048	0.2619	-1.16
BRF UPDATE	724.9	362.9	2.00

$s = 695.6$ $R\text{-sq} = 40.2\%$ $R\text{-sq(adj)} = 26.4\%$

Analysis of Variance

SOURCE	DF	SS	MS
Regression	3	4228945	1409648
Error	13	6290137	483857
Total	16	10519082	

SOURCE	DF	SEQ SS
CONFIG RANGE	1	400755
CONFIG DEPTH	1	1897860
BRF UPDATE	1	1930329

APPENDIX L

FOURTH FLIGHT FFG-7 ISNSL ALLOWANCE ADDITIONS

TABLE 110
FOURTH FLIGHT FFG-7 GF ISNSL ALLOWANCE ADDITIONS

Hull	ISNSL	GF SRI Allw	GF SRI Addds	GF SRI Addds %	GF OSI Allw	GF OSI Addds	GF OSI Addds %
50	2	10277	3035	29.532	4085	652	15.960
50	3	10236	3496	34.154	3938	113	2.869
51	2	10262	2093	20.395	4088	246	6.017
51	3	10463	1907	18.226	3983	135	3.389
52	2	10331	1939	18.768	3939	121	3.071
52	3	10404	2986	28.700	3981	628	15.774
53	2	9704	2722	28.050	4082	696	17.050
54	2	10225	1746	17.075	3942	112	2.841
54	3	10211	1596	15.630	4041	350	8.661
55	2	10281	2110	20.523	3984	127	3.187
55	3	10408	3072	29.515	4056	404	9.960
56	2	10325	1639	15.874	4038	243	6.017
56	3	10492	2422	23.084	4074	474	11.634
57	2	10486	1686	16.078	4084	360	8.814
57	3	10943	1784	16.302	4279	573	13.391
58	2	10396	1700	16.352	4056	369	9.097
58	3	10836	1736	16.020	4299	461	10.723

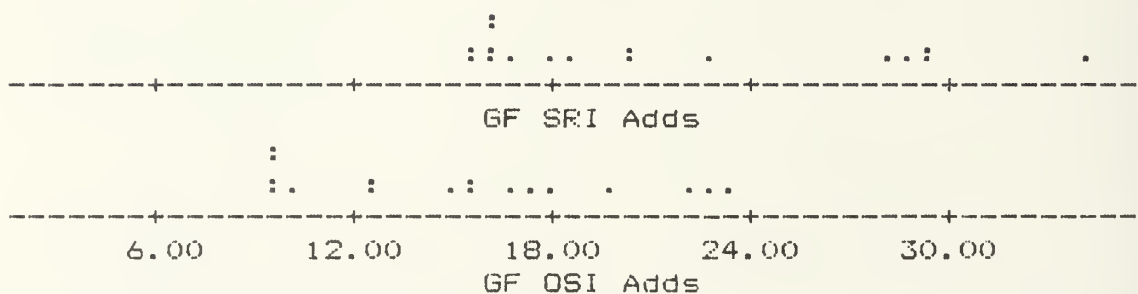


Figure 56. Fourth Flight FFG-7 GF SRI vs GF OSI Allowance Additions Dotplot

TABLE 111
FOURTH FLIGHT FFG-7 GF SRI vs GF OSI
ISNSL ALLOWANCE ADDITIONS T TEST AND
ANALYSIS OF VARIANCE

T Test for GF SRI ADDS VS GF OSI ADDS

	N	MEAN	STDEV	SE MEAN
GF SRI ADDS	17	21.43	6.15	1.5
GF OSI ADDS	17	8.73	4.89	1.2

95 PCT CI FOR MU GF SRI ADDS - MU GF OSI ADDS: (8.8, 16.6)
TTEST MU GF SRI ADDS = MU GF OSI ADDS (VS NE): T=6.66
P=0.0000 DF=30.4

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	1369.9	1369.9	44.42
ERROR	32	986.9	30.8	
TOTAL	33	2356.9		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI ADDS	17	21.43	6.15	(-----*-----)
GF OSI ADDS	17	8.73	4.89	(-----*-----)
POOLED STDEV = 5.554				-----+-----+-----+-----
				10.0 15.0 20.0

TABLE 112
FOURTH FLIGHT FFG-7 CF ISNSL ALLOWANCE ADDITIONS

Hull	ISNSL	CF SRI Allw	CF SRI Addds	CF SRI % Addds	CF OSI Allw	CF OSI Addds	CF OSI % Addds
50	2	4437	932	21.005	415	28	6.747
50	3	4660	498	10.686	429	27	6.293
51	2	4326	1141	26.375	400	13	3.250
51	3	4299	811	18.864	407	27	6.633
52	2	4417	1063	24.066	409	32	7.824
52	3	4492	1204	26.803	417	38	9.112
53	2	4484	1033	23.037	424	46	10.849
54	2	4319	616	14.262	406	28	6.896
54	3	4275	1138	26.619	427	33	7.728
55	2	4462	738	16.539	428	31	7.243
55	3	4577	1168	25.518	447	55	12.304
56	2	4602	619	13.450	436	30	6.880
56	3	4629	783	16.915	441	22	4.988
57	2	4471	1361	30.440	432	70	16.203
57	3	4646	657	14.141	449	28	6.236
58	2	4552	813	17.860	446	31	6.950
58	3	4788	614	12.823	460	24	5.217

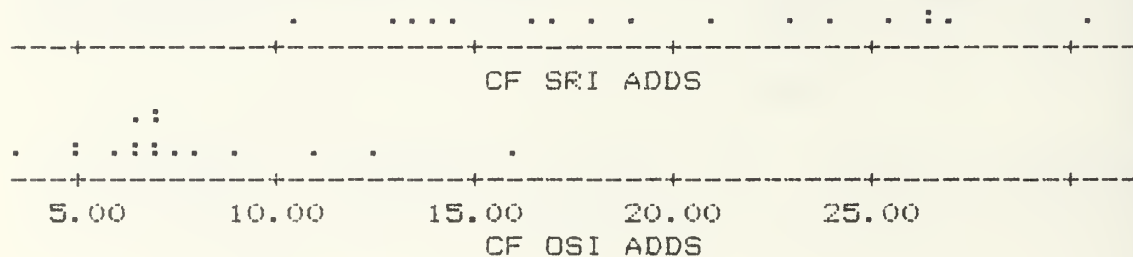


Figure 57. Fourth Flight FFG-7 CF SRI vs CF OSI Allowance Additions Dotplot

TABLE 113
FOURTH FLIGHT FFG-7 CF SRI VS CF OSI
ISNSL ALLOWANCE ADDITIONS T TEST AND
ANALYSIS OF VARIANCE

T Test for CF SRI ADDS VS CF OSI ADDS

	N	MEAN	STDEV	SE MEAN
CF SRI ADDS	17	19.97	5.98	1.5
CF OSI ADDS	17	7.73	3.03	0.74

95 PCT CI FOR MU CF SRI ADDS - MU CF OSI ADDS: (8.9, 15.60)
TTEST MU CF SRI ADDS = MU CF OSI ADDS (VS NE): T=7.52
P=0.0000 DF=23.7

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	1273.1	1273.1	56.61
ERROR	32	719.7	22.5	
TOTAL	33	1992.8		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
CF SRI	17	19.97	5.98	-----+-----+-----+----- (-----*-----)
ADDS				
CF OSI	17	7.73	3.03	(----*----)
ADDS				
POOLED STDEV =	4.742			-----+-----+-----+----- 10.0 15.0 20.0

TABLE 114
FOURTH FLIGHT FFG-7 CF AND GF SRI ISNSL
ALLOWANCE ADDITIONS PERCENTAGES

Hull	ISNSL	GF SRI % Adds	CF SRI % Adds
50	2	29.532	21.005
50	3	34.154	10.686
51	2	20.395	26.375
51	3	18.226	18.864
52	2	18.768	24.066
52	3	28.700	26.803
53	2	28.050	23.037
54	2	17.075	14.262
54	3	15.630	26.619
55	2	20.523	16.539
55	3	29.515	25.518
56	2	15.874	13.450
56	3	23.084	16.915
57	2	16.078	30.440
57	3	16.302	14.141
58	2	16.352	17.860
58	3	16.020	12.823

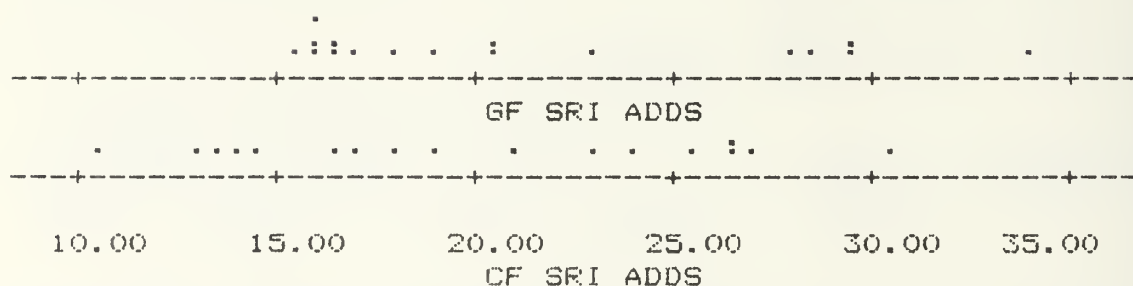


Figure 58. Fourth Flight FFG-7 GF SRI vs CF SRI Allowance Additions Dotplot

TABLE 115
FOURTH FLIGHT FFG-7 GF VS CF SRI
ISNSL ALLOWANCE ADDITIONS T TEST AND
ANALYSIS OF VARIANCE

T Test for GF SRI ADDS VS CF SRI ADDS

	N	MEAN	STDEV	SE MEAN
GF SRI ADDS	17	21.43	6.15	1.5
CF SRI ADDS	17	19.97	5.98	1.5

95 PCT CI FOR MU GF SRI ADDS - MU CF SRI ADDS: (-2.8, 5.7)
TTEST MU GF SRI ADDS = MU CF SRI ADDS (VS NE): T=0.70 P=0.49
DF=32.0

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	18.2	18.2	0.49
ERROR	32	1177.7	36.8	
TOTAL	33	1195.9		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI	17	21.43	6.15	-----+-----+-----+-----
ADDS				(-----*-----)
CF SRI	17	19.97	5.98	(-----*-----)
ADDS				
POOLED STDEV =		6.067		-----+-----+-----+-----
				19.2 21.6 24.0

TABLE 116
FOURTH FLIGHT FFG-7 CF AND GF OSI ISNSL
ALLOWANCE ADDITION PERCENTAGES

Hull	ISNSL	GF OSI % Adds	CF OSI % Adds
50	2	15.960	6.747
50	3	2.869	6.293
51	2	6.017	3.250
51	3	3.389	6.633
52	2	3.071	7.824
52	3	15.774	9.112
53	2	17.050	10.849
54	2	2.841	6.896
54	3	8.661	7.728
55	2	3.187	7.243
55	3	9.960	12.304
56	2	6.017	6.880
56	3	11.634	4.988
57	2	8.814	16.203
57	3	13.391	6.236
58	2	9.097	6.950
58	3	10.723	5.217

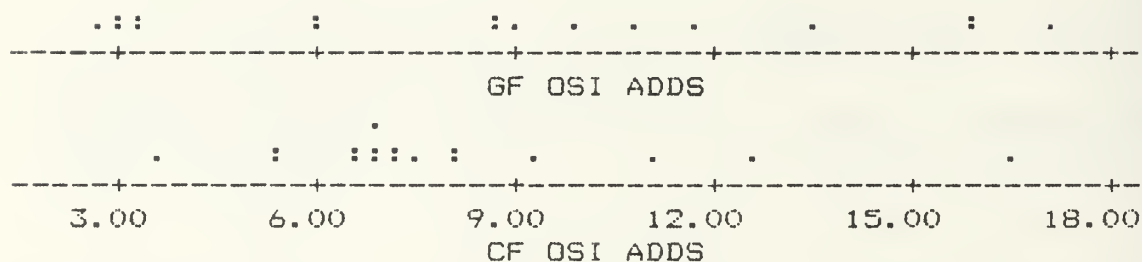


Figure 59. Fourth Flight FFG-7 GF OSI vs CF OSI Allowance Additions Dotplot

TABLE 117
FOURTH FLIGHT FFG-7 GF OSI VS CF OSI
ISNSL ALLOWANCE ADDITIONS
ANALYSIS OF VARIANCE

T Test for GF OSI ADDS VS CF OSI ADDS

	N	MEAN	STDEV	SE MEAN
GF OSI ADDS	17	8.73	4.89	1.2
CF OSI ADDS	17	7.73	3.03	0.74

95 PCT CI FOR MU GF OSI ADDS - MU CF OSI ADDS: (-1.9, 3.87)
TTEST MU GF OSI ADDS = MU CF OSI ADDS (VS NE): T=0.72 P=0.48
DF=26.7

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	8.6	8.6	0.52
ERROR	32	528.9	16.5	
TOTAL	33	537.5		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF OSI	17	8.73	4.89	(-----+-----+-----+-----)
ADDS				(-----*-----)
CF OSI	17	7.73	3.03	(-----*-----)
ADDS				
POOLED STDEV = 4.066				-----+-----+-----+-----
				7.0 8.4 9.8

TABLE 118
FOURTH FLIGHT FFG-7 ISNSL ALLOWANCE ADDITIONS
ANALYSIS OF VARIANCE
BY SUPPLIER AND STORAGE LOCATION

SOURCE	DF	SS	MS	F
FACTOR	3	2669.0	889.7	33.36
ERROR	64	1706.6	26.7	
TOTAL	67	4375.6		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	-----+-----+-----+-----+-----
GF SRI ADDS	17	21.43	6.15	(---*---)
GF OSI ADDS	17	8.73	4.89	(---*---)
CF SRI ADDS	17	19.97	5.98	(---*---)
CF OSI ADDS	17	7.73	3.03	(---*---)
				-----+-----+-----+-----+-----
POOLED STDEV =		5.164	6.0	12.0 18.0 24.0

APPENDIX M

FOURTH FLIGHT FFG-7 ISNSL ALLOWANCE ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE

TABLE 119
FOURTH FLIGHT FFG-7 ISNSL ALLOWANCE ADDITIONS
PERCENTAGES ANNUAL BRF UPDATE A FACTOR

Hull	ISNSL	GF SRI % Adds	GF OSI % Adds	CF SRI % Adds	CF OSI % Adds
50	2	29.53	15.96	21.00	6.75
51	2	20.39	6.02	26.38	3.25
52	3	28.70	5.77	26.80	9.11
53	2	28.05	17.05	23.04	10.85
54	3	15.63	8.66	26.62	7.73
55	3	29.52	9.96	25.52	12.30
56	3	23.08	11.63	16.92	4.99
57	3	16.08	8.81	30.44	16.20
58	2	16.35	9.09	17.86	6.95

TABLE 120
FOURTH FLIGHT FFG-7 ISNSL ALLOWANCE ADDITION
PERCENTAGES ANNUAL BRF UPDATE NOT A FACTOR

Hull	ISNSL	GF SRI % Adds	GF OSI % Adds	CF SRI % Adds	CF OSI % Adds
50	3	34.15	2.87	10.69	6.29
51	3	18.23	3.39	18.86	6.63
52	2	18.77	3.07	24.07	7.82
54	2	17.08	2.84	14.26	6.90
55	2	20.52	3.19	16.54	7.24
56	2	15.87	6.02	13.45	6.88
57	3	16.30	13.39	14.14	6.23
58	3	16.02	10.72	12.82	5.22

TABLE 121
FOURTH FLIGHT FFG-7 GF SRI ISNSL ALLOWANCE
ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update A Factor			Annual BRF Update Not a Factor		
Hull	ISNSL	GF SRI % Adds	Hull	ISNSL	GF SRI % Adds
50	2	29.53	50	3	34.15
51	2	20.39	51	3	18.23
52	3	28.70	52	2	18.77
53	2	28.05	54	2	17.08
54	3	15.63	55	2	20.52
55	3	29.52	56	2	15.87
56	3	23.08	57	3	16.30
57	3	16.08	58	3	16.02
58	2	16.35			

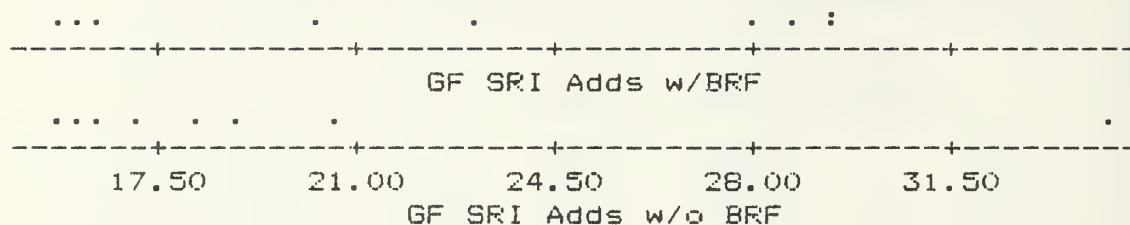


Figure 60. Fourth FFG-7 Class GF SRI Allowance Additions
Dotplot Stratified by Annual BRF Update

T Test for GF SRI Adds w/BRF VS GF SRI Adds w/o BRF

```
TTEST MU GF SRI Adds w/BRF = MU GF SRI Adds w/o BRF (VS NE):
T=1.16 P=0.27 DF=14.8
```

LEVEL	N	MEAN	STDEV
GF SRI	9	23.04	6.09
Adds w/BRF			
GF SRI	8	19.62	6.08
Adds w/o BRF			
POOLED STDEV = 6.085 16.0 20.0 24.0 28.0			

Annual BRF Update A Factor				Annual BRF Update Not a Factor			
Hull	ISNSL	GF OSI % Adds		Hull	ISNSL	GF OSI % Adds	
50	2	15.96		50	3	2.87	
51	2	6.02		51	3	3.39	
52	3	5.77		52	2	3.07	
53	2	17.05		54	2	2.84	
54	3	8.66		55	2	3.19	
55	3	9.96		56	2	6.02	
56	3	11.63		57	3	13.39	
57	3	8.81		58	3	10.72	
58	2	9.09					

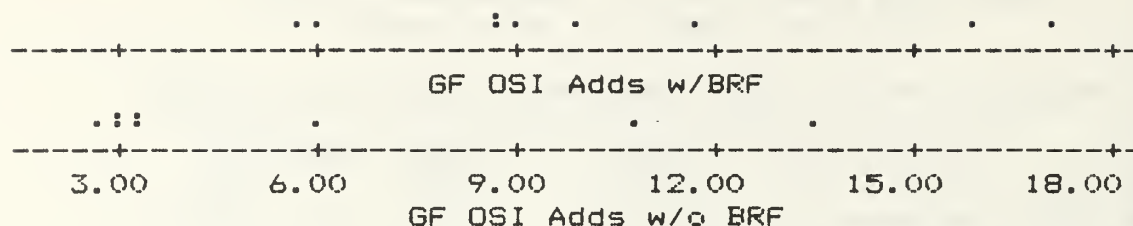


Figure 61. Fourth FFG-7 GF OSI ISNSL Allowance Additions
Dotplot Stratified by Annual BRF Update

TABLE 124
FOURTH FLIGHT FFG-7 GF OSI ISNSL ALLOWANCE
ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for GF OSI Adds w/BRF VS GF OSI Adds w/o BRF

	N	MEAN	STDEV	SE MEAN
GF OSI Adds w/BRF	9	10.33	3.95	1.3
GF OSI Adds w/o BRF	8	5.69	4.13	1.5

95 % CI FOR MU GF OSI Adds w/BRF - MU GF OSI Adds w/o BRF:
(0.4, 8.9)

TTEST MU GF OSI Adds w/BRF = MU GF OSI Adds w/o BRF (VS NE):
T=2.36 P=0.033 DF=14.6

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	91.2	91.2	5.61
ERROR	15	243.9	16.3	
TOTAL	16	335.1		

INDIVIDUAL 95 PCT CI'S FOR MEAN BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF OSI Adds w/BRF	9	10.33	3.95	(-----*-----)
GF OSI Adds w/o BRF	8	5.69	4.13	(-----*-----)
POOLED STDEV = 4.032				+-----+-----+-----+-----
				3.0 6.0 9.0 12.0

TABLE 125
FOURTH FLIGHT FFG-7 CF SRI ISNSL ALLOWANCE
ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update A Factor			Annual BRF Update Not a Factor		
Hull	ISNSL	CF SRI % Adds	Hull	ISNSL	CF SRI % Adds
50	2	21.00	50	3	10.69
51	2	26.38	51	3	18.86
52	3	26.80	52	2	24.07
53	2	23.04	54	2	14.26
54	3	26.62	55	2	16.54
55	3	25.52	56	2	13.45
56	3	16.92	57	3	14.14
57	3	30.44	58	3	12.82
58	2	17.86			

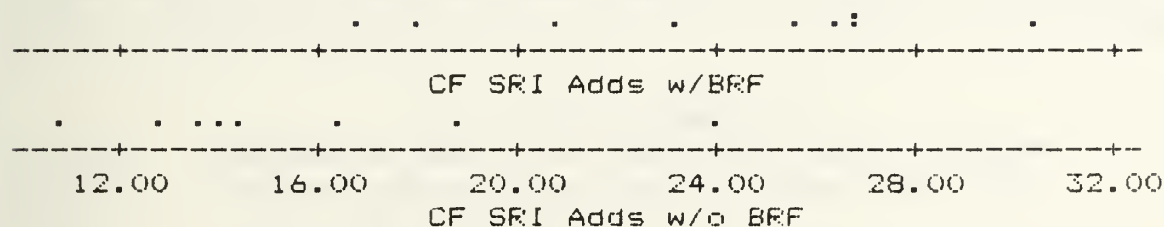


Figure 62. Fourth FFG-7 CF SRI ISNSL Allowance Additions
Dotplot Stratified by Annual BRF Update

TABLE 126
FOURTH FLIGHT FFG-7 CF SRI ISNSL ALLOWANCE
ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for CF SRI Adds w/BRF VS CF SRI Adds w/o BRF

	N	MEAN	STDEV	SE MEAN
CF SRI Adds w/BRF	9	23.84	4.50	1.5
CF SRI Adds w/o BRF	8	15.60	4.20	1.5

95 PCT CI FOR MU CF SRI Adds w/BRF - MU CF SRI Adds w/o BRF:
(3.7, 12.8)

TTEST MU CF SRI Adds w/BRF = MU CF SRI Adds w/o BRF (VS NE):
T=3.90 P=0.0016 DF=14.9

Analysis of Variance				
SOURCE	DF	SS	MS	F
FACTOR	1	287.5	287.5	15.11
ERROR	15	285.3	19.0	
TOTAL	16	572.8		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	-----+-----+-----+-----
CF SRI Adds w/BRF	9	23.84	4.49	(-----*-----)
CF SRI Adds w/o BRF	8	15.60	4.20	(-----*-----)
				-----+-----+-----+-----
POOLED STDEV = 4.361				16.0 20.0 24.0

TABLE 127
FOURTH FLIGHT FFG-7 CF OSI ISNSL ALLOWANCE
ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update A Factor			Annual BRF Update Not a Factor		
Hull	ISNSL	CF OSI % Adds	Hull	ISNSL	CF OSI % Adds
50	2	6.75	50	3	6.29
51	2	3.25	51	3	6.63
52	3	9.11	52	2	7.82
53	2	10.85	54	2	6.90
54	3	7.73	55	2	7.24
55	3	12.30	56	2	6.88
56	3	4.99	57	3	6.23
57	3	16.20	58	3	5.22
58	2	6.95			

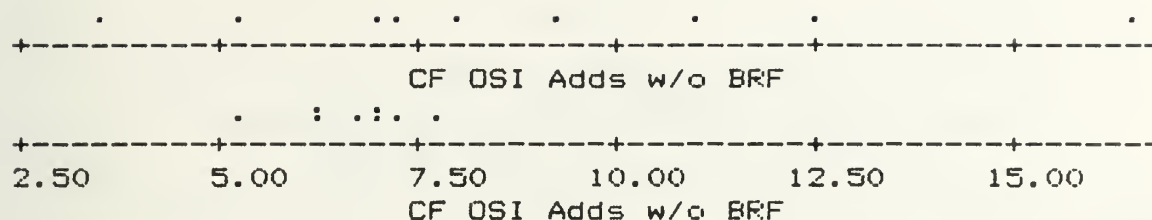


Figure 63. Fourth FFG-7 CF OSI ISNSL Allowance Additions
Dotplot Stratified by Annual BRF Update

TABLE 128
FOURTH FLIGHT FFG-7 CF OSI ISNSL ALLOWANCE
ADDITIONS STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for CF OSI Adds w/o BRF VS CF OSI Adds w/o BRF

	N	MEAN	STDEV	SE MEAN
CF OSI Adds w/o BRF	9	8.68	3.96	1.3
CF OSI Adds w/o BRF	8	6.651	0.773	0.27

95 % CI FOR MU CF OSI Adds w/o BRF - MU CF OSI Adds w/o BRF:
(-1.1, 5.14)

TTEST MU CF OSI Adds w/o BRF = MU CF OSI Adds w/o BRF (VS
NE): T=1.51 P=0.17 DF=8.7

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	17.45	17.45	2.02
ERROR	15	129.45	8.63	
TOTAL	16	146.90		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
CF OSI	9	8.68	3.96	(-----*-----)
Adds w/o BRF				
CF OSI	8	6.65	0.77	(-----*-----)
Adds w/o BRF				
POOLED STDEV = 2.938				-----+-----+-----+-----
				6.0 8.0 10.0

TABLE 129
FOURTH FLIGHT FFG-7 ANALYSIS OF VARIANCE
STRATIFIED BY ANNUAL BRF UPDATE

SOURCE	DF	SS	MS	F	
FACTOR	7	3234.0	462.0	22.83	.
ERROR	60	1214.1	20.2		
TOTAL	67	4448.1			

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF SRI Adds	9	23.04	6.09	(---*---)
GF OSI Adds	9	10.33	3.95	(---*---)
CF SRI Adds	9	23.84	4.49	(---*---)
CF OSI Adds	9	8.68	3.96	(---*---)
				7.5 15.0 22.5

Annual BRF Update a Factor

GF SRI Adds	8	19.62	6.08	(---*---)
GF OSI Adds	8	5.69	4.13	(---*---)
CF SRI Adds	8	15.60	4.20	(---*---)
CF OSI Adds	8	6.65	0.77	(---*---)
				7.5 15.0 22.5

Annual BRF Update Not a Factor

POOLED STDEV = 4.49

APPENDIX N

FOURTH FLIGHT FFG-7 ISNSL ALLOWANCE DELETIONS

TABLE 130
FOURTH FLIGHT FFG-7 ISNSL ALLOWANCE DELETIONS

Hull	ISNSL	GF Allw	GF Del	GF % Del	CF Allw	CF Del	CF % Del
50	2	14362	2327	16.202	4852	1061	21.867
50	3	14174	1560	11.006	5089	273	5.364
51	2	14350	2304	16.055	4726	720	15.234
51	3	14446	1594	11.034	4706	684	14.534
52	2	14270	2022	14.169	4826	251	5.201
52	3	14385	2298	15.975	4909	1104	22.489
53	2	13789	2740	19.870	4908	1179	24.022
54	2	14167	2175	15.352	4725	519	10.984
54	3	14252	2111	14.812	4702	1137	24.181
55	2	14265	2050	14.370	4890	357	7.300
55	3	14464	3335	23.057	5024	1003	19.964
56	2	14363	1205	8.389	5038	459	9.110
56	3	14566	2182	14.980	5070	877	17.297
57	2	14570	2144	14.715	4903	628	12.808
57	3	15222	1211	7.955	5095	372	7.301
58	2	14425	2014	13.961	4998	1005	20.108
58	3	15135	1119	7.393	5248	260	4.954

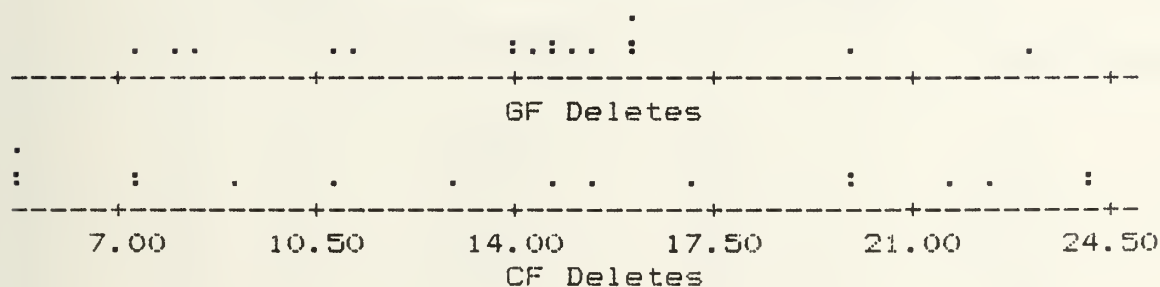


Figure 64. Fourth Flight FFG-7 GF vs CF ISNSL Allowance Deletions Dotplot

TABLE 131
FOURTH FLIGHT FFG-7 GF VS CF ISNSL ALLOWANCE DELETIONS
T TEST AND ANALYSIS OF VARIANCE

T Test for GF Deletes VS CF Deletes

	N	MEAN	STDEV	SE MEAN
GF Deletes	17	14.08	4.05	0.98
CF Deletes	17	14.28	6.98	1.7

95 PCT CI FOR MU GF Deletes - MU CF Deletes: (-4.24, 3.8)
TTEST MU GF Deletes = MU CF Deletes (VS NE): T=-0.10 P=0.92
DF=25.7

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	0.3	0.3	0.01
ERROR	32	1043.2	32.6	
TOTAL	33	1043.6		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF	17	14.08	4.05	(-----+-----+-----+-----)
Deletes				(-----*-----)
CF	17	14.23	6.98	(-----*-----)
Deletes				(-----+-----+-----+-----)
POOLED STDEV =		5.710		12.8 14.4 16.0

APPENDIX O

FOURTH FLIGHT FFG-7 ISNSL ALLOWANCE DELETIONS STRATIFIED BY ANNUAL BRF UPDATE

TABLE 132
FOURTH FLIGHT FFG-7 ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update A Factor				Annual BRF Update Not a Factor			
Hull	ISNSL	GF % Del	CF % Del	Hull	ISNSL	GF % Del	CF % Del
50	2	16.202	21.867	50	3	11.006	5.364
51	2	16.055	15.234	51	3	11.034	14.534
52	3	15.975	22.489	52	2	14.169	5.201
53	2	19.870	24.022	54	2	15.352	10.984
54	3	14.812	24.181	55	2	14.370	7.300
55	3	23.057	19.964	56	2	8.389	9.110
56	3	14.980	17.297	57	3	7.955	7.301
57	2	14.715	12.808	58	3	7.393	4.954
58	2	13.961	20.801				

TABLE 133
FOURTH FLIGHT FFG-7 GF ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update A Factor			Annual BRF Update Not a Factor		
Hull	ISNSL	GF % Deletes	Hull	ISNSL	GF % Deletes
50	2	16.202	50	3	11.006
51	2	16.055	51	3	11.034
52	3	15.975	52	2	14.169
53	2	19.870	54	2	15.352
54	3	14.812	55	2	14.370
55	3	23.057	56	2	8.389
56	3	14.980	57	3	7.955
57	2	14.715	58	3	7.393
58	2	13.961			

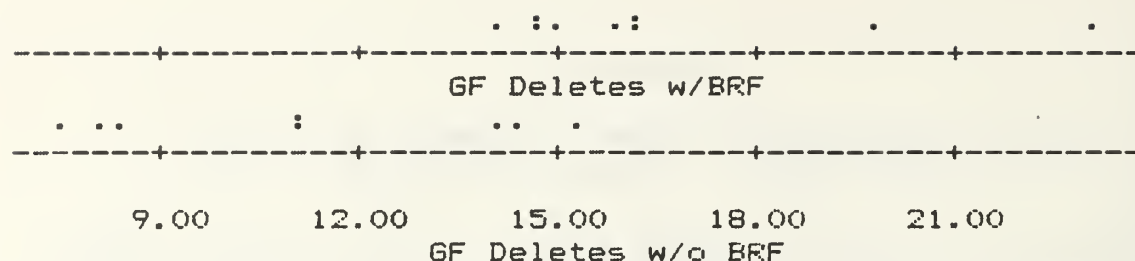


Figure 65. Fourth Flight FFG-7 GF ISNSL Allowance Deletions
Dotplot Stratified by Annual BRF Update

TABLE 134
FOURTH FLIGHT FFG-7 GF ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for GF Deletes w/BRF VS GF Deletes w/o BRF

	N	MEAN	STDEV	SE MEAN
GF Deletes w/BRF	9	16.63	2.95	0.98
GF Deletes w/o BRF	8	11.21	3.14	1.1

95 PCT CI FOR MU GF Deletes w/BRF - MU GF Deletes w/o BRF:
(2.23, 8.6)

TTEST MU GF Deletes w/BRF = MU GF Deletes w/o BRF (VS NE):
T=3.65 P=0.0026 DF=14.5

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	124.26	124.26	13.44
ERROR	15	138.66	9.24	
TOTAL	16	262.92		

INDIVIDUAL 95 PCT CI'S FOR MEAN BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF Deletes w/BRF	9	16.63	2.95	(-----*-----)
GF Deletes w/o BRF	8	11.21	3.14	(-----*-----)
POOLED STDEV = 3.040				9.0 12.0 15.0 18.0

TABLE 135
FOURTH FLIGHT FFG-7 CF ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE

Annual BRF Update A Factor			Annual BRF Update Not a Factor		
Hull	ISNSL	CF % Deletes	Hull	ISNSL	CF % Deletes
50	2	21.867	50	3	5.364
51	2	15.234	51	3	14.534
52	3	22.489	52	2	5.201
53	2	24.022	54	2	10.984
54	3	24.181	55	2	7.300
55	3	19.964	56	2	9.110
56	3	17.297	57	3	7.301
57	2	12.808	58	3	4.954
58	2	20.801			

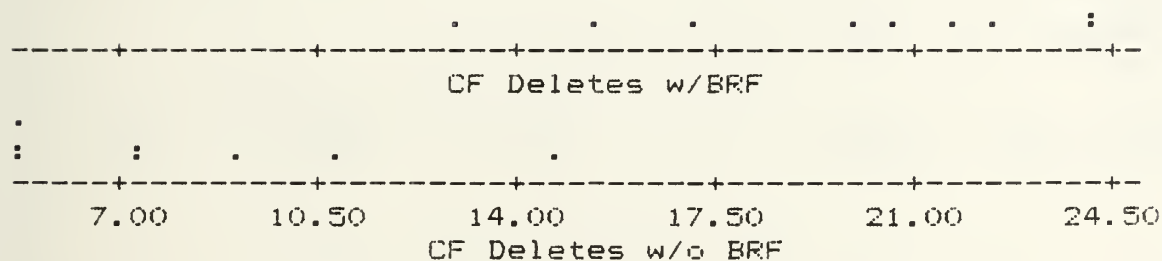


Figure 66. Fourth Flight FFG-7 CF ISNSL Allowance Deletions
Dotplot - Annual BRF Update a Factor

TABLE 136
FOURTH FLIGHT FFG-7 CF ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE
T TEST AND ANALYSIS OF VARIANCE

T Test for CF Deletes w/BRF VS CF Deletes w/o BRF

	N	MEAN	STDEV	SE MEAN
CF Deletes w/BRF	9	19.85	3.96	1.3
CF Deletes w/o BRF	8	8.09	3.33	1.2

95 PCT CI FOR MU CF Deletes w/BRF - MU CF Deletes w/o BRF:
(8.0, 15.6)

TTEST MU CF Deletes w/BRF = MU CF Deletes w/o BRF (VS NE):
T=6.64 P=0.0000 DF=15.0

Analysis of Variance

SOURCE	DF	SS	MS	F
FACTOR	1	585.5	585.5	43.20
ERROR	15	203.3	13.6	
TOTAL	16	788.8		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	-----+-----+-----+-----
CF Deletes w/BRF	9	19.85	3.96	(-----*-----)
CF Deletes w/o BRF	8	8.09	3.33	(-----*-----)
POOLED STDEV = 3.682				-----+-----+-----+-----
				10.0 15.0 20.0

TABLE 137
FOURTH FLIGHT FFG-7 ISNSL ALLOWANCE DELETIONS
STRATIFIED BY ANNUAL BRF UPDATE
ANALYSIS OF VARIANCE

SOURCE	DF	SS	MS	F
FACTOR	3	710.3	236.8	20.77
ERROR	30	342.0	11.4	
TOTAL	33	1052.3		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
GF Deletes	9	16.63	2.95	(---*---)
w/BRF				
CF Deletes	9	19.85	3.96	(----*----)
w/BRF				
GF Deletes	8	11.21	3.14	(---*---)
w/o BRF				
CF Deletes	8	8.09	3.33	(----*----)
w/o BRF				
POOLED STDEV = 3.376				-----+-----+-----+-----
				10.0 15.0 20.0

APPENDIX F

FFG-7 AND SSBN ISNSL DATA COMPARISON

TABLE 138
FFG-7 AND SSBN-726 CF ISNSL ALLOWANCE DELETIONS
ANNUAL BRF UPDATE A FACTOR

Hull	ISNSL	CF % Del	Hull	ISNSL	CF % Del	Hull	ISNSL	CF % Del
41	3	23.647	50	2	21.867	727	2	14.914
42	3	23.157	51	2	15.234	727	5	22.208
43	2	22.750	52	3	22.489	729	2	14.271
43	4	26.918	53	2	24.022	730	3	12.731
45	3	22.056	54	3	24.181	731	3	11.638
46	2	24.971	55	3	19.964	733	2	83.825
46	4	18.639	56	3	17.297			
47	2	19.745	57	2	12.808			
47	4	19.231	58	2	20.108			
48	2	19.986						
48	3	20.587						
49	2	20.004						
49	4	19.906						

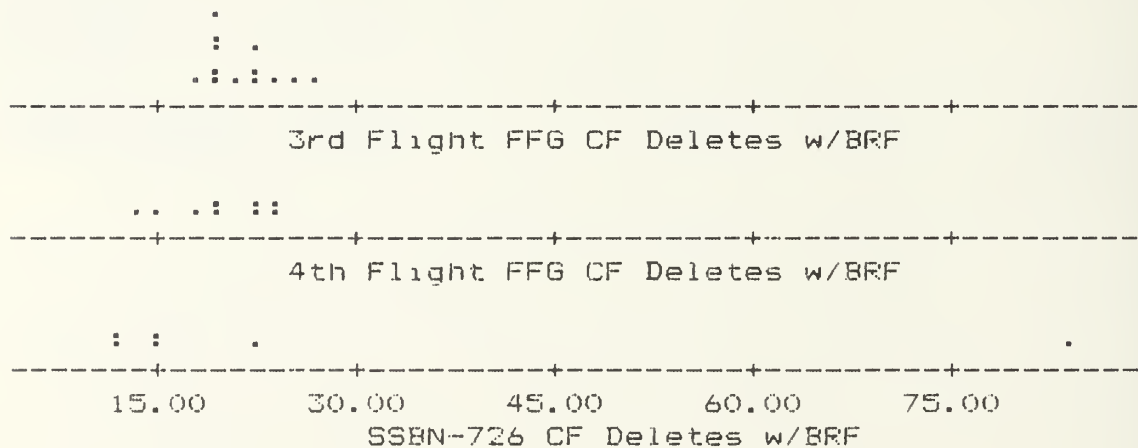


Figure 67. FFG-7 vs SSBN-726 ISNSL Allowance Deletions
Dotplot Annual BRF Update a Factor

TABLE 139
FFG-7 VS SSBN-726 CF ISNSL ALLOWANCE DELETIONS
ANNUAL BRF UPDATE A FACTOR
ANALYSIS OF VARIANCE

SOURCE	DF	SS	MS	F
FACTOR	2	173	86	0.51
ERROR	25	4198	168	
TOTAL	27	4370		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
3rd Flt	13	21.66	2.49	(-----*-----)
CF Deletes w/BRF				
4th Flt	9	19.77	3.95	(-----*-----)
CF Deletes w/BRF				
SSBN-726	6	26.60	28.28	(-----*-----)
CF Deletes w/BRF				
POOLED STDEV = 12.96				-----+-----+-----+-----
				15.0 22.5 30.0

TABLE 140
FFG-7 AND SSBN-726 CF ISNSL ALLOWANCE DELETIONS
ANNUAL BRF UPDATE NOT A FACTOR

Hull	ISNSL	CF	Hull	ISNSL	CF	Hull	ISNSL	CF
		% Del			% Del			% Del
40	4	9.554	50	3	5.364	727	3	9.511
41	4	9.067	51	3	14.534	727	4	4.262
42	4	6.853	52	2	5.201	727	6	6.866
43	3	7.527	54	2	10.984	729	3	4.816
45	2	8.918	55	2	7.300	730	2	19.029
45	4	11.078	56	2	9.110	731	2	8.451
46	3	12.238	57	3	7.301			
47	3	7.929	58	3	4.954			
48	3	16.373						
49	3	10.427						

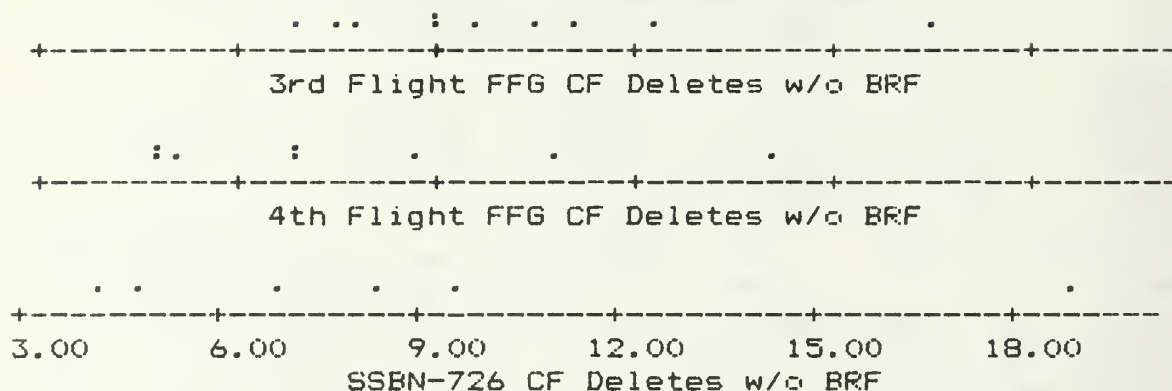


Figure 68. FFG-7 vs SSBN-726 CF ISNSL Allowance Deletions
Dotplot Annual BRF Update Not a Factor

TABLE 141
FFG-7 VS SSBN-726 CF ISNSL ALLOWANCE DELETIONS
ANNUAL BRF UPDATE NOT A FACTOR
ANALYSIS OF VARIANCE

SOURCE	DF	SS	MS	F
FACTOR	2	16.6	8.3	0.59
ERROR	21	292.8	13.9	
TOTAL	23	309.4		

INDIVIDUAL 95 PCT CI'S FOR MEAN
BASED ON POOLED STDEV

LEVEL	N	MEAN	STDEV	
3rd Flt	10	9.99	2.78	(-----*-----)
CF Deletes w/o BRF				
4th Flt	8	8.09	3.33	(-----*-----)
CF Deletes w/o BRF				
SSBN-726	6	8.82	5.39	(-----*-----)
CF Deletes w/o BRF				
POOLED STDEV =		3.734		

LIST OF REFERENCES

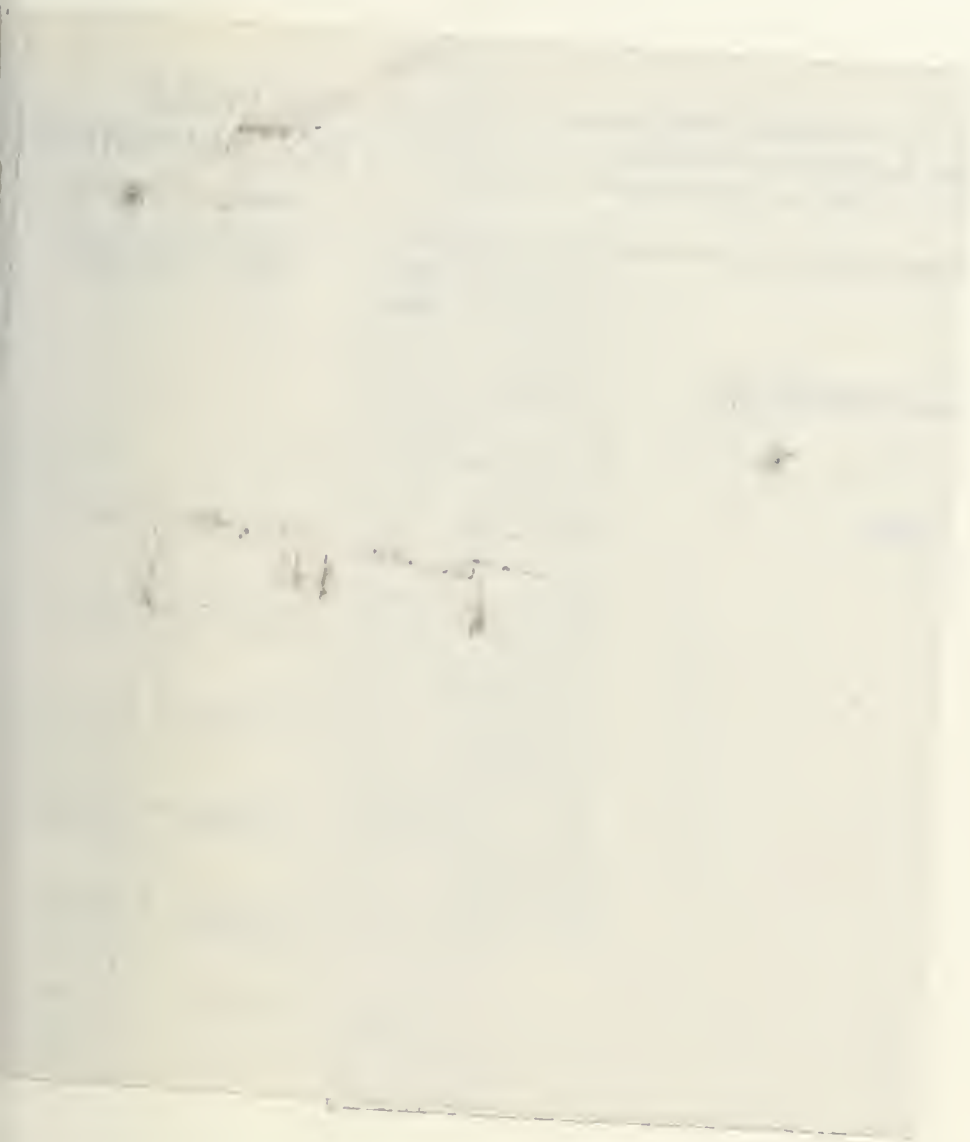
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